Creation Research Society Quarterly

Haec credimus:
For in six days the Lord made heaven and earth, the sea, and
all that in them is, and rested on the seventh. — Exodus 20:11

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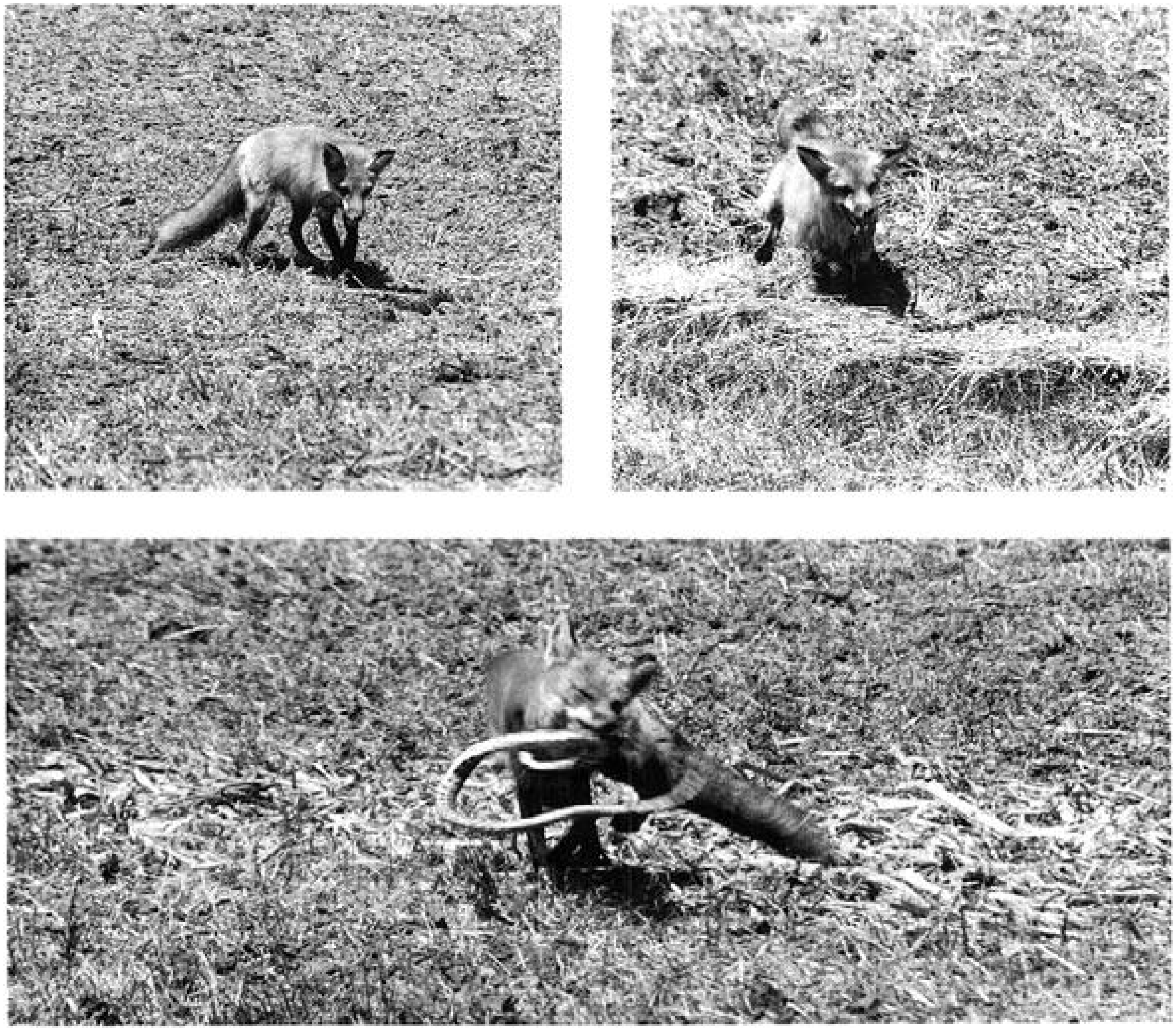

FOX CATCHES FOX SNAKE

CREATION RESEARCH SOCIETY

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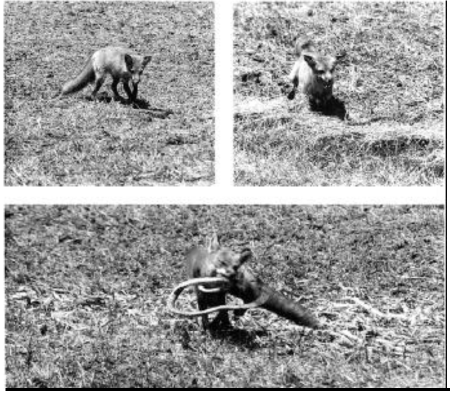

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The cover photographs are by **Jerry Whitesell. For the story about this fox, see page 157.**

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CREATION RESEARCH SOCIETY

History The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and over 1100 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as the outstanding publication in the field.

Activities The society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. The Society operates two Experiment Stations, the Grand Canyon Experiment Station in Chino Valley, Arizona and the Grasslands Study Site in Weatherford, Oklahoma.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are $20.00 ($24.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 969, Ashland, OH 44805-0969. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at $20.00 ($24.00 foreign) per year and includes a subscription to the Quarterlies. All others interested in receiving copies of all these publications may do so at the rate of the subscription price for all issues or one year: $23.00 ($27.00 foreign).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms. We propose to reevaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity,* through Zondervan Publishing House, Grand Rapids, Michigan 49506. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

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Editors' Comments

Two new features in this issue are introduced for your reading interest and pleasure. It seemed to us that once each year CRSQ readers should hear directly from the president of the society. Down through these 32 years of CRS publications the president has always set a tone for CRS activity. Our current president is a man who has willingly handled almost every task in CRS, at one time or another, and sometimes all at once. He was one of the principal originators of our series of monographs (CRS Books) and for years handled the storage and shipping. When he took over as senior editor of the Quarterly, he (like his predecessor, Harold Armstrong) had no "associate editor" but performed both tasks himself. It was he who spearheaded the reprinting, promoting, and reviewing of previous CRSQ issues. He was the key member of a three-person team that decided on Chino Valley and purchased our present Van Andel Research Center (VARC) site. Likewise he was the research committee chairman who assisted John Meyer in establishing VARC. There is much more that reflects Emmett Williams' commitment to God's work in CRS but let us just say "Hats off!" as we read his annual column.

Our second novelty herein is labeled "Photo Essays;" we hope these will become a continuing feature. We invite interested parties to submit to the editor striking photographs of God's handiwork. With the picture, please send a few well-documented paragraphs stating how the photograph supports young-earth creationism. We are happy to introduce this series with Jerry Whitesell's cover pictures of the fox and fox snake and its attendant essay by John Meyer and Glen Wolfrom.

We continue to encourage readers to promote the CRS Quarterly. Consider sending gift subscriptions to friends—both laymen and technical people. Feel free to correspond with the authors themselves and to send Letters to the Editor for possible publication.

Eugene F. Chaffin
George F. Howe

FROM A to Z WITH BILL RUSCH, SR.
A SPECIAL OFFER

Fortunately, the late and great Dr. Bill Rusch produced two timeless books which contain a wealth of well-documented origins information on theology, biology, geology, anthropology, and history. This creationist pioneer, speaker, author, churchman, and respected college professor has provided background sections wherein he clarifies and defines terms. Likewise he has presented science units on many specific themes such as cyclothems, amber, and fossil skulls.

Wilbert Rusch was one of the key creation-scientists of this century. He has left an important legacy and we want CRS readers and others to have these two books at 15% discount:

The Argument: Creationism vs. Evolutionism $8.95
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Each book retails at $8.95 which is $17.90 total plus $3.00 postage and handling—$20.90. These books are yours at only $15.00 plus $3.00 postage and handling—$18.00 total, a savings of $2.90. Offer good until June 30, 1996.

WHY DID GOD CREATE POISONS AND TOXINS?

JERRY BERGMAN*

Received 5 January 1994; Revised 6 August 1994

Abstract

The problem of toxicity is considered. It is concluded that many myths exist about the subject of poisons and toxins. A major one is that a dichotomy exists between poisonous and nonpoisonous chemicals when in actuality nothing is toxic in small levels, and all chemicals are toxic in high amounts. Further, most all chemicals which have a high level of toxicity have an important function in life, and because compounds can be used in a harmful way does not negate their importance when used appropriately. It is not the compound that is the problem, but the use.

When reading about cases of children dying from mercury or lead poisoning (or murders in which someone used the deadly poison arsenic) some may ask, "Why did God make poisons? Why would He create chemicals that serve to harm people? Would not such harm be contrary to His plan?" A commonly used argument by atheists is: Would a loving God make deadly chemicals which have served to kill millions of people?

The terms "poison," "toxic," "pesticide," "herbicide," and "preservative" all imply that, because some chemicals may function in this role, they must always be detrimental to humans. The implied dichotomy between the words toxic and non-toxic, or "poison" and "non-poison," is wholly artificial and impedes understanding of the toxicity problem (Woods, 1991). Chemicals are not toxic or poisonous, only amounts are: No chemical is toxic in small levels, and all chemicals are toxic in large amounts (Bergman, 1992). In Stevens' words, "Anything in a large enough dose can prove toxic" (1990, p. 1). Even water is toxic if a certain amount is ingested, and can cause a coma or is even fatal if ingested in high levels during a short period of time (Christian, 1992). Oxygen is also necessary for life, but as every nurse knows, excess amounts are lethal. A poison is only too much of a certain chemical in the wrong place. Lower amounts of many "poisons" in the right cells are actually necessary for life. For example, vitamins A and E are critical for life, but are toxic if taken in high dosages. All vitamins and minerals cause toxicity at certain levels. We are discovering that many chemicals found in nature have important uses (Griffith, 1988). Fire has caused the loss of an enormous number of lives, yet it has also saved countless lives and still serves us well by heating our homes, cooking our food, sterilizing medical equipment and other uses.

A good example of the time and place concern is the drug thalidomide. It became infamous for causing a large number of birth defects, primarily if taken during pregnancy at a certain time. This teratogenic agent caused children to be born with missing or misshapen limbs (Fine, 1972; Knightley et al., 1979). Unfortunately, the image of this drug has caused researchers to avoid exploring its potential uses. Recent studies, though, have found that it is among the most effective existing treatments for leprosy, and can improve the survival rate enormously of patients who receive bone-marrow transplants. It has also been used to successfully treat other potentially fatal disorders which include aplastic anemia and certain kinds of bone cancers. Aplastic anemia is anemia caused by aplasia, a failure of an organ to develop; thus in this disease the bone marrow—where most of the blood cells are produced—fails to develop or becomes diseased. Another use of thalidomide is to reduce the graft-vs.-host disease problem by reducing the voraciousness with which grafted foreign tissue attempts to reject its new home.

An excellent example of the fact that all substances are toxic in large amounts is water intoxication, described by Tisdale:

> The volume of water both inside and outside the cells increases, but the salt does not, and brain cells swell, then shrink. . . . Water intoxication can occur accidentally, especially in the medical treatment of a dehydrated person. But it happens most frequently among schizophrenics. For reasons as mysterious as any other in the realm of psychosis, schizophrenics sometimes have a compulsive need to drink water. Compulsions are exactly that, impossible to overcome, demanding in the most lordly and imperative of voices (1988, p. 27).

And an FDA report stated:

> FDA has recently received five reports of hospitalizations involving water intoxication of young infants. Preliminary reports indicate that three infants were admitted to the hospital with seizures and hyponatremia apparently associated with relatively large intakes of free water. The other two infants were reported to have low blood sodium levels on admission that were believed to be related to water ingestion (FDA Medical Bulletin, May, 1994, p. 5).

The Case of Arsenic

Probably the most famous of all poisons, arsenic, is actually a vital mineral for many animal metabolic systems. It is commonly used as an insecticide or rodenticide, and most arsenic based pest control products contain copper acetoarsenate, or calcium or lead arsenate (Stevens, 1990). Arsenic compounds cause death by their ability to interfere with the body's energy producing processes in the mitochondria found within the cell. The specific mechanism of arsenic poisoning is usually due to its inhibition of pyruvate dehydrogenase, the enzyme that breaks pyruvate down in the mitochondria so it can be processed for energy production. Arsenic also causes glucose stores to be decreased and inhibits glucose production (Reichl et al., 1989). It is also carcinogenic and teratogenic.

Conversely, as Lederer and Fensterheim (1983, p. 185) note, the research data indicate that "arsenic is an essential element for several animal species." One vital

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role that arsenic plays in many animals is as an enzyme component to metabolize protein and certain amino acids, including methionine, arginine and taurine. Wardlaw and Insel (1990, p. 437) note that "adults need about 12 to 25 micrograms per day." The most common ways of measuring body arsenic levels are hair and fingernail sample analysis and urinalysis (Poskanzer, 1980). Normal persons have an average concentration of 0.005 mg of arsenic per hundred grams of hair, and excrete between 0.01 and 0.06 mg arsenic per liter of urine.

The Botulinum Toxin

In evaluating toxins, it is imperative to discuss the most poisonous substance in the world—botulin, the neurotoxin produced by the single-celled bacterium *Clostridium botulinum* (Jankovic and Brin, 1991). Botulin is "six-million times more toxic than rattle snake venom" and a lethal dose for humans is a mere 1/10,000th of a milligram (Waters, 1992, p. 30). Botulin poisoning usually results from eating improperly canned or contaminated food, and results in muscle paralysis (Lundberg, 1990). It does this by permanently attaching itself to nerve endings and blocking neurotransmitters—chemicals which cause the nerve impulse to travel from one nerve to another at the synapse junction. By binding to nerve endings, the toxin prevents the release of the acetylcholine neurotransmitter. Similar to permanently jamming a light switch so that it cannot be turned on, it blocks the nerves so that the brain's signals cannot reach a muscle, and as a result the muscle becomes severely weakened or paralyzed if enough nerves are blocked. It causes death because the chest muscles are not able to perform their breathing function, consequently the person suffocates.

Yet, this most dreaded of all toxins is a miracle drug for people suffering from conditions such as dystonias—involuntary muscle spasms which cause eyelids to blink or clamp shut, the neck to twist into painful contortions, writer's cramps and loss of voice (Heneson, 1990). The dystonias in general result from too many nerve signals to the muscles, causing them to overreact. This uncontrolled muscle spasm can result from both voluntary and involuntary excessive electrical-brain impulses. In the area of cerebral palsy treatment, botulin holds enormous promise for millions of Americans in helping to control sposticity and tics (Chen, 1991; Rodman, 1991; Talan, 1990; Hussar, 1990). Success has also been achieved with severe stuttering by injecting the toxin into the vocal cords—providing potential relief for millions of sufferers.

Botulin therapy is a major breakthrough for blepharospasm, an uncontrollable eye blinking that sometimes involves other facial throat and neck muscles. It is also effective for both chronic writer's and musician's cramps—an especially severe problem for students who must write extensively, and for violinists and even pianists. It is also effective for spasmodic dysphonia, a muscle spasm which effects the pharynx, resulting in an extremely strained voice (Ludlow, 1990). The treatment is injection of botulinum into the thyroarytenoid muscles that control the vocal cords. One of the most useful areas is for the treatment of spasmodic torticollis, an extremely painful, debilitating neck spasm which causes the head to thrust about uncontrollably (D'Costa, 1992).

Botulinum treatment is also highly effective in about eighty-five percent of all cases of strabismus, the general cross-eye, or wall-eye condition. This malady is usually outgrown by about age six months, but if it persists, surgery was often the only alternative until the development of botulin treatment. Strabismus is caused by an over active eye muscle on one side, and a weak muscle on the other. The brain processes light information picked up by the retina by combining both the left and right signals, and if the weak eye is too much out of alignment with the dominant one, the brain will rely solely upon the stronger eye signals. If this continues for too long a period of time, the brain will become unable to interpret images from the weaker eye, thus it will let it drift—a condition called amblyopia or lazy eye. The result is that the person can use only one eye, and consequently has little depth of field and experiences much difficulty in judging distances. Amblyopia carries a considerable social stigma and often results in major psychological and social adjustment problems.

The surgical treatment involves cutting away a portion of the hyperactive muscle to weaken it and allow the eye to line up properly. The new treatment is to use precisely targeted injections of botulin to inactivate the spastic or hyperactive muscle. In most cases, this technique restores normal control to the patient without the need for invasive surgery. Botulin weakens the spastic or over developed eye muscles in the same way that it weakens the muscle pull of persons suffering from botulism toxin. Unfortunately, the results are not permanent—new nerve endings eventually replace those blocked by the drug. Nonetheless, it is now the most effective treatment for amblyopia and is regarded as established medical practice.

Other uses include treatment of oromandibular dystonia (involuntary movements of the jaw, lower facial, and tongue muscles), laryngeal dystonia (larynx muscle spasms which cause speech difficulties), and other movement disorders, and even tremors such as hemifacial spasm, an involuntary twitching or contraction of the muscles on one side of the face (Jonkovic and Brin, 1991). The incidence of the dystonia family of diseases is about 390 cases per million population. Before the botulin treatment, few effective means existed to help the large number of people afflicted with these problems. One study found its success rate was 85% in long term follow-up (Jankovic and Brin, 1991). Many persons in the past assumed that these diseases were psychosomatic—and the discovery that they are not has both relieved sufferers and helped to reassure physicians that these patients are not untreatable.

Botulin is an extremely complex molecule—its molecular weight is a whopping 80 times that of insulin. Its large number of atoms must be assembled with the precision of a fine watch. Its commercial and laboratory production is a complex specialty which still is more an art than a science, and is primarily directed by investigator Ed Schantz. Schantz has been researching growing the bacteria to effectively extract the toxin for about fifty years. His lifetime experience was required to achieve the skill needed to effectively isolate it from the bacteria for therapy use. Fortunately, because it is so lethal, an effective dose is usually only about one-millionth of a milligram (Waters, 1992, p. 32).

Ironically, the usefulness of botulin to the bacterium itself is not yet known. It is an anaerobic organism, once common when home canning and other means of preserving food was done improperly. Although one occasionally reads about cases, it is a rare concern today because commercial canners must by law heat their products up to temperatures and pressures high enough to kill not just the bacterium, but also the botulism spores. The bacteria that causes it is an extremely common soil and water bacteria spore. The proper conditions cause the spore to develop into the rod-shaped bacterium *Clostridium botulinum.*

Other Toxins

Whitney et al. (1990) summarize some of the evidence that indicates many other well-known toxins, including mercury, lead, silver, barium, and even cadmium, all play key roles in nutrition and health. Research is currently being completed to specify in more detail what these uses are. It is now well established that barium, a poison rated "5" on a scale of 1-6 (thus extremely toxic), which even in low levels can severely irritate the eyes, nose, throat and skin, is vital for proper growth. Even medium toxic levels of it cause cardiac irregularities, convulsions, and death from cardiac and respiratory failure (Stevens, 1990). Other highly toxic vital minerals include iodine, also with a toxicity rating of 5, which is needed for the synthesis of thyroid hormones. Vanadium is necessary for bone development and normal reproduction, cobalt is an essential part of vitamin B_{12} molecules, silicon is involved in bone calcification, and nickel is critical for the activity of certain enzymes and evidently also for iron metabolism (Wardlaw and Insel, 1990).

Many other trace minerals that are necessary for proper health are also toxic in relatively low amounts (Spallholz, 1981). Selenium is extremely poisonous (toxic at 0.2 mg/m^3) and if inhaled in sufficient amounts causes skin lesions, nervous system disorders, damage to the teeth and Lou Gehrig's disease. It is also an essential element, needed as part of enzymes that work as antioxidants. These compounds reduce the level of polyunsaturated acid oxidation, now considered by many researchers to be a major cause of arteriosclerosis (Spallholz, 1981). Selenium's role as an antioxidant is also complementary to that of vitamin E, and neither can replace the other. The recommended intake for adults is .05 to .2 mg daily (Christian, 1992).

According to several studies, selenium also has a protective effect against certain cancers, although probably its most important biological function is part of the enzyme glutathione peroxidase. This compound helps to minimize the cellular structure damage called peroxidation which, regardless of whether it is produced naturally or is chemically induced, can lead to cancer. The glutathione peroxidase enzyme destroys oxidative compounds that would otherwise oxidize chemicals in the cell, consequently destroying some organelles and eventually the cell. A number of studies have also indicated that selenium is extremely important in bolstering the body's immune system. The indications are now that its ability to reduce cancer is so dramatic that some researchers recommend daily supplements for the population in general.

It was determined that a past outbreak of heart disease in hundreds of thousands of children in certain parts of China in the 1970s was due to selenium deficiency. Correction of this diet deficiency has now almost totally eliminated the problem called Keshan disease (Christian and Greger, 1992, p. 456). The cause of the deficiency was because the soil in these areas was selenium poor, a condition that also correlates with certain kinds of cancer. Most Westerners are largely protected from such severe selenium deficiencies because their food is generally obtained from a wide variety of areas around the country (Spallholz, et al., 1981, p. 172). Also, meat and animal products, which are a major part of the Western diet, tend to be good sources of selenium.

The Case of Chromium

Chromium, which causes cancer, corrodes skin and nasal membranes, and can damage the kidneys and even the body's immune response system (toxic at 0.1 mg/m^3 or less) has also been shown to be an essential trace element (Fisher, 1990). Studies of patients for whom prolonged intravenous feeding was the sole source of nutrition has vividly demonstrated the importance of chromium for the normal metabolism of glucose. It interacts with insulin to aid the entry of glucose into the cell at the cell membrane entry port, and consequently it controls the energy supply for cell use. When chromium is lacking, the effectiveness of insulin is also impaired.

Because chromium tissue concentration typically declines with advancing age, and its deficiency may contribute to the development of adult-onset diabetes, many nutritionists recommend chromium supplements. Studies of diets which include chromium supplements have found that the element . . . can help control blood pressure, increase stamina, help firm up the body and build muscle (Fisher, 1990). Its absorption level depends upon the ion ingested, and the Cr^{+++} ion seems to be the form best absorbed and is most effective in living systems. The dietary supplement that is most effective is a preparation called chromium picolinate. The body also has a natural protective mechanism to prevent over absorption by causing absorption to increase with low dietary intake and decrease with high dietary intake.

Chromium is also an essential mineral that participates in carbohydrate and lipid (fat) metabolism. Chromium supplements can help to correct glucose imbalances by lowering high blood glucose concentration in people with diabetes, and raise low blood glucose concentrations as found in patient's with hypoglycemia. Since chromium deficiency can also raise serum cholesterol and LDL concentration, and lower HDL concentration, chromium supplements can help prevent coronary artery disease. Unfortunately, the more refined the food, typically the less chromium that it contains. For this reason, some researcher's estimate that a high level of the population does not ingest enough dietary chromium. Fisher (1990) concludes that up to 90% of us do not ingest enough of this vital nutrient" Chromium is particularly high in vegetable oils, brewer's yeast, whole grains, nuts, egg yolks, meats, and certain kinds of cheeses, but is often poorly absorbed, thus supplements are often recommended.

One of the better well-known examples of the need for balance is in vitamin use. Most every school child knows that vitamins are necessary for good health. Unfortunately though, many people believe that since small amounts of vitamins are essential, larger amounts are better and megadoses are better yet. Thus, overdosing on vitamins is now a major problem. Called hypervitaminosis, the most common symptoms include nausea, diarrhea, rashes, fatigue, and eventually death. Especially of concern are the fat soluble vitamins (A, D, E and K), and the most common vitamin for which overdose is a problem is vitamin A (Whitney and Sizer, 1994). Although necessary for the maintenance of skin, hair and mucous membranes, as well as vision and bone and tooth growth, high doses of vitamin A can cause serious health problems, and not uncommonly death. For this reason, many health experts recommend that supplementary vitamins should be taken only under the advice of a physician.

Natural versus Synthetic

Much of the concern over toxicity relates to the labels synthetic versus natural, a chemical division that is artificial and in many cases meaningless. The assumption that compounds made by nature are good, and those made by humans are bad (or at least have a far greater chance of being bad) is not valid. Although some have attempted to develop legal definitions, most all synthetic chemicals are nothing more than modified, and sometimes not greatly so, natural chemicals. Each chemical also has to be evaluated separately for toxicity concerns regardless of its source. Because this is true for all of the ten million chemical substances listed in the 1990 Chemical Abstracts shows that scientists have a lot of work to do.

Many persons tend to think of natural compounds as non-poisonous, and human-made ones as more likely to be harmful. This is not a valid generalization: All plants, including those used by us for food, produce their own specific natural compounds which were designed to be toxic as a means of protection against pests, including insects, fungi, and animals (Woods, 1991a). Humans are generally safe if they eat a balanced diet consisting of small amounts of a wide variety of foods. Since all foods contain toxins, the only concern should be the level that we are exposed to of each type of compound, and whether or not our liver can adequately detoxify the level of the compound ingested. This organ is marvelously efficient at rendering excess amounts of potentially lethal compounds harmless. Our body, if healthy and not overburdened, is actually extremely effective in rendering normally encountered levels of most toxins inert.

We should also be very cautious, but not paranoid, about utilizing chemicals which have not yet been adequately tested. On the other hand, many chemicals exist which we know are extremely highly toxic to humans, and yet many people do not seem very concerned about them (Woods, 1991). An example is hundreds of the over four thousand chemicals commonly found in cigarette smoke are extremely toxic to humans. One, radioactive polonium-210 (half-life = 138.4 days) is one of the most toxic substances known to mankind, yet we tend to worry more about Aspartame® which has a toxicity of something like a millionth of polonium-210 (Bergman, 1992). This information is thus not just useful, but could also mean saving lives if applied to reduce toxins in one's environment.

Some Conclusions

Compounds are not poisonous or toxic, the problem with poisons and toxins is a matter of excess and how a compound is used. Compounds which are highly toxic in some situations can be life-saving in other situations. The toxicity problem is solely a matter of degree, i.e., all compounds are toxic in high levels, and no compound is toxic in low levels. The toxicity concern is best described as one of fit, i.e., in one situation a compound is functional in another situation the same level is dysfunctional. The fact that some compounds are dysfunctional in certain situations in low levels does not support the common conclusion that some compounds are not dangerous and others are dangerous or toxic. The focus should be on the proper use of a compound in a given situation, and that all compounds and elements can be either beneficial, neutral or harmful, depending upon the situation. A review of selected common examples of poisons and toxins shows that they serve very specific roles in health, and even though research on some of these elements such as arsenic and botulism toxins has only just begun.

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LETTERS TO THE EDITOR

Some Initial Thoughts Regarding Catastrophic Plate Tectonics

The last thirty to forty years have witnessed a revolution in the earth sciences with the general acceptance and application of plate tectonics. A significant, but largely unnoticed, part of the revolution has been the ability to reconcile the heritage of a strict nineteenth century uniformitarianism with singular; discontinuous events such as continents colliding, new crust forming along vast rifts at the midoceanic ridges, and the plunge of cold crust into the depths of the mantle. Plate tectonics has also been popularized with great success in many media, and its simplicity has facilitated its use in education at all levels Lowman, 1992). While these developments within uniformitarian geology are interesting in and of themselves, and deserve attention from the CRSQ readership, creationist questions surrounding plate tectonics have now moved into sharper focus with the publication of a plate tectonics interpretation of the Genesis flood (Austin, Baumgardner, Humphreys, Snelling, Vardiman, and Wise, 1994).

These authors, who possess significant creationist geologic expertise, posit the rapid subduction of the pre-flood ocean floor at the onset of the Flood event, and the subsequent development of new oceanic crust. Their paper should be welcomed as a serious discussion of the geological implications of the biblical record, but should also be critically evaluated. One path for such an evaluation would be to compare similarities between catastrophic and uniformitarian plate tectonics proposals. This would allow a parallel path of critical thought in areas where the distinctions between the catastrophic and uniformitarian versions are not explicitly stated or logically inferred. In addition, differences between the two should be examined to see whether or not they solve existing problems in uniformitarian plate tectonics and/or raise new difficulties. We intend to offer a brief introduction to both uniformitarian and catastrophic tectonic constructs in a short paper to be submitted soon. In it we will introduce several issues raised by the catastrophic plate tectonic proposal of Austin et al. (1994).

One area worth examination is philosophical rather than strictly scientific. It would be aided by insights from philosophers, especially philosophers of science. In the complex classification of ideas, what is the concept of plate tectonics? Is it a theory, a model, a new discipline, or something else? Scientists tend towards careless usage of such terms, and to our knowledge the interrelationships between observed data and intellectual constructs in plate tectonics thought has not been rigorously addressed on the uniformitarian side, and is not addressed in Austin et al. (1994). An examination of the history of the plate tectonics revolution bears great similarity to Kuhn's earlier thought (1970), and might lead to the conclusion that plate tectonics is a *paradigm* (perhaps not in the Kuhnian sense of "exemplary problem solutions"; 1977; pp. xix-xx, but in a broader sense). If so, what is its relationship to other paradigms of modern geology such as uniformitarianism?

This concern for philosophical insight raises the question of how historical research ought to be performed in a creationist framework. This issue is discussed in a series recently submitted to CRSQ (Reed and Froede, in preparation). We submit that geological models of earth history are mixed questions,* and should be constrained from the top down, but developed from the bottom up. In other words, geological models of young-earth creationists will be outlined before field evidence is encountered, simply because the questions of earth history are not the exclusive domain of geology. However, those models will be only skeletons until they are tested and refined in the field. Any catastrophist concept of plate tectonics must be constrained within a biblical-Christian philosophical framework by evidence from all relevant historical sources. We are certain that Austin et al. (1994) would agree that the primary historical source is the scriptural record. The interplay between the scriptural constraints that outline a model, and the physical data that develop a model, should be examined and clarified. For example, is it the scriptural phrase ". . . all the fountains of the great deep burst open . . ." (Genesis 7:11, NASB) or geophysical datasets that require events similar to those described by plate tectonics? Clearly, whether the answer is "Genesis" or "geophysics," the specifics of evidence and analysis remain undefined. Therefore, in the context of a mixed question approach, the distinctions between constraining a model and developing it must be cited with precision to enable the reader to exercise critical thought with the same precision.

Catastrophic and uniformitarian plate tectonic concepts share assertions, inviting comparisons both supportive and critical. A wide variety of evidence has historically been submitted to demonstrate uniformitarian plate tectonics. A recent summary by Cronin (1992, pp. 13-14) would probably be accepted by a majority of geologists:

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*The mixed question approach as defined by Adler (1965) recognizes that each intellectual discipline is based on its own special methods and special questions. When questions arise that cross disciplinary lines, they are addressed by a combination of disciplines (e. g., science and philosophy), and are considered mixed questions because they are not exclusively within the domain of any single discipline.

> The actual cornerstone of plate tectonics is the collection of observations that unambiguously shows that, among other things,
> (1) Earth's outer surface is composed of an interlocking array of lithospheric plates,
> (2) most earthquakes and magmatic activity occur along the margins of plates,
> (3) all plates are in motion relative to one another,
> (4) plates diverge along the mid-ocean ridges, where new crust forms to fill the gaps, in a process known as sea-floor spreading,
> (5) mantle lithosphere is resorbed as it sinks into the deeper mantle in subduction zones
> (6) the bathymetry of ocean basins is related to the variation in age and thermal structure of the plates,
> (7) the apparent offset of midocean-ridge segments is opposite to the actual sense of slip along the intervening transform fault,
> (8) oceanic fracture zones emanate from both ends of a given transform fault,
> (9) collision of continental lithosphere is a mechanism for the generation of mountain ranges, and
> (10) the oldest continental crust is Archean in age, whereas the oldest oceanic crust that is still in an ocean basin is Jurassic. *[format altered]*

Our understanding of the Austin et al. (1994) paper leads us to conclude that the authors would accept many of these ten points as lines of evidence for their catastrophic proposal. Thus, criticism of these ten assertions would be largely considered critical of their model. Correspondingly, positive support for these criteria in their evidentiary value to plate tectonics would also provide support for the catastrophic plate tectonic concept.

Conversely, the similarities between the two plate tectonics views open the catastrophic version to criticisms commonly leveled at its counterpart. These usually include questions regarding the mechanisms of plate motions, the integration of new data sets discovered since the acceptance of plate tectonics, new questions about the fundamental datasets that lent early support to plate tectonics, and specific field data that are not congenial to plate tectonics explanations. Although the shortened timeframe of the catastrophic version may solve several traditional problems of uniformitarian plate tectonics, it also imposes new difficulties that must be resolved, particularly in the global application of proposed physical mechanisms of plate motion.

Alternate uniformitarian views, though clearly in the minority, include the historical expansion of the earth (Carey, 1976), relatively *in situ* rotation of "hemispherical megaplates" (Storetvedt, 1992, p. 212), and a concept entitled "surge tectonics" (Meyerhoff, Taner, Morris, Martin, Agocs, and Meyerhoff, 1992) which entails a scheme of ridge-parallel flow of asthenospheric material as the basis for the formation of the earth's crustal features. Note that any model based on Newtonian physics and claiming to offer a comprehensive explanation must definitively interpret all given datasets or fail in its presuppositions. Because all models of earth history are rooted in the unobservable events of the past, any model offered will necessarily include some arguments from lack of data. This weakness cannot be avoided, and should be confronted at the outset. Thus, alternate views from the catastrophist side are lacking that relies somewhat on decades of uniformitarian research. However, this imprecision may provide one crucial advantage to the advocates of alternative catastrophic concepts—the ability to answer, "I don't know," to broad questions that may not have a sufficient empirical basis for comprehensive theoretical conclusions.

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Creation and The Cretaceous

My copy of June 1995 CRSQ arrived two days ago. I am pleased with the mail service and think the magazine is great.

I enjoyed Carl Froede's article "Late Cretaceous epeiric sea or retreating floodwater" in which he suggests that the widespread areas of Cretaceous sediments on the western and eastern parts of the North American continent were deposited by Flood waters as they slowly receded. I believe that creationists would be able to better decide where the strata fit within a Biblical geological framework if a more systematic and disciplined approach were followed. The simple Biblical geological model (Walker, 1994) presented at Pittsburgh was an attempt to formulate such an approach. I would like to illustrate this approach with the Cretaceous strata in question.

Firstly, the presence of fossils in the Cretaceous strata would rule out deposition during the six day Creation event.

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Secondly, the very large scale of the strata (thickness and aerial extent) would rule out deposition in the time between Creation and the Flood (the Lost-World era) because we would expect geological processes to be of limited scale (not unlike today). In addition these strata sit on great thicknesses of fossiliferous rocks whereas we would expect Lost-World strata to sit upon unfossiliferous Creation rocks, generally unconformably.

The idea of deposition during the Flood event as Froede suggests is consistent with the presence of fossils and the large scale of the strata. But when? The position of the strata at the top of great thickness of fossiliferous rocks would suggest late in the Flood event which is also Froede's conclusion. This timing is also supported by the fact that the terrestrial vertebrate fossils were disarticulated indicating transport and disintegration before burial (Froede, 1995, p. 15) which would require time. However, the fact that the Cretaceous strata frequently contain footprints would strongly suggest they were deposited during the Inundatory stage while the Floodwaters were still advancing and before all the world was covered by water and all air breathing creatures were destroyed. As an example, Bezy (1992, p. 8) speaks of thousands of footprints preserved in Cretaceous coal beds in the Bryce Canyon area. The latter phase of the Inundatory stage when the Floodwaters were nearing their peak is most likely and has been termed the Zenithic phase in the Pittsburgh model.

As this illustrates, footprints are one very important criterion that creationists should seek out to help determine where strata fit within a Biblical geological framework.

Even though dinosaurs were probably amphibians it is likely that they would still have perished once all the land was completely covered by water. This idea is also supported by the fact that they disappeared from the scene at the end of the Cretaceous.

Could these Cretaceous strata have been laid down after the Flood during the New-World era? The large scale of the strata would suggest not although it may be possible for such large structures to be formed in the first few centuries after the Flood as the continents drained, settled down tectonically and were covered by ice sheets. However the presence of dinosaur footprints in the strata would tend to rule out deposition even during this period. It is most unlikely that such large numbers of dinosaurs would have lived in North America at this time after migrating from Mt. Aarat.

So, by a systematic process of elimination we can conclude that the Cretaceous strata of North America would most likely have been laid down late in the Inundatory stage of the Flood, that is the Zenithic phase as defined in the Pittsburgh model.

For a more confident conclusion it would be necessary to check that the criteria relevant to the Biblical model fit the strata faithfully across the whole area. It is possible that the Cretaceous classification which is based on an evolutionary interpretation using fossils may not match the Biblical criteria consistently.

I was pleased to see that Michael Oard, in a separate article in the same issue (Oard, 1995), referred to this model and similarly concluded that the Cretaceous strata containing dinosaur footprints and nests are not from the Recessive stage of the Flood but were deposited during the late Inundatory stage.

I believe a systematic approach to Biblical geology such as this will eliminate much of the confusion and disagreement as to where the geological strata belong. I hope that we will soon produce geological maps showing how the rocks in each area fit within a Biblical framework.

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Another Embarrassing "Early Man"

Probably everyone interested in the creation / evolution controversy has heard about the Nebraska tooth claimed to represent "the oldest of all human remains known to science" (Smith, 1922, p. 944), which turned out to be from an extinct species of pig. But how many know about the second pithecanthropine skull found in Java?

A Reuter report in the daily press of September 27, 1926, "announced the discovery by Professor Heberlein [Dr. C.E.J. Heberlein, government physician and amateur geologist] of what is said to be a complete skull of the type *Pithecanthropus erectus*, the well-known Java skull." (Anonymous, 1926a, p. 491.)

Four weeks later it was reported (Anonymous, 1926b, p. 639) that the facial portion was missing but it showed the frontal bone, the upper part of the right and a little of the left temporal bones, and the supra-orbital ridge.

A month and a half after this it was announced (Anonymous, 1926c, p. 887) that the specimen was the top of the humerus bone of an extinct species of elephant.

Dr. Ales Hrdlicka (Hrdlicka, 1930, p. 62) at the Smithsonian Institution made the correction. He became suspicious when magnified photographs showed portions to be of a spongy nature rather than cranial type bone. An assistant brought the humerus of an Indian elephant for comparison and it practically duplicated the Java specimen. Another set of photographs was sent to Dr. Dubois, finder of the original Java skullcap, and he independently identified it as the proximal part of the humerus of *Stegodon,* an extinct elephant.

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Carcharodon megalodon: IS THIS THE ANTEDILUVIAN GREAT WHITE SHARK?

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Abstract

Sharks represent an interesting problem for uniformitarian paleontologists. They suddenly appear fully formed in the Devonian Period with no apparent ancestors. One shark species in particular, ***Carcharodon megalodon,*** *is known from its abundant teeth found in rocks which "date" to the uniformitarian Miocene. Some scientists have suggested that the "modern" great white shark (i.e.,* ***Carcharodon carcharias)*** *might represent the same shark species as* ***C. megalodon.*** *However, serious questions remain regarding whether these were the same species of shark. While* ***C. megalodon*** *and* ***C. carcharias*** *are clearly within the same genus, they likely should remain as separate species. Many young earth creationists believe that during the Antediluvian timeframe* **both** *mankind and animals had longer lifespans than present.* ***Carcharodon megalodon,*** *like the dinosaurs, are believed to have continually grown until they were killed, either during the catastrophic conditions associated with the Flood event or they eventually died from old age (possibly Post-Flood). Longer periods of growth, proposed for the antediluvian timeframe, could have allowed* ***C. megalodon*** *to grow to its maximum size potential. Other environmental factors might still allow for the possibility that a living* ***C. megalodon*** *might be found in the oceans of the planet.*

Introduction

Shark teeth represent some of the most popular fossils to be found by both amateur and professional paleontologists, because they are easily recognized and do not require specialized identification. Fossilized shark teeth, found in various strata around the world, range in size from one-quarter of an inch to six inches in height.

This paper addresses the age and size relationship of the antediluvian (now extinct?) *Carcharodon megalodon* shark to its modern day relative (same genus) *Carcharodon carcharias,* otherwise known as the great white shark (Figure 1). Some uniformitarian scientists have suggested that *C. carcharias,* the modern great white shark, might be a direct descendent of *C. megalodon* or have a common ancestry (See Cousteau and Richards, 1992, pp. 24, 27; Maisey, 1987, p. 16). However, others would suggest that *C. megalodon* was just an overgrown version of the modern great white shark (Brown, 1973, p. 79; Springer and Gold, 1989, p. 49; Case, 1982, pp. 264-265).

Sharks In General

Today there are approximately 368 shark species recognized with new species described every year (Springer and Gold, 1989, p. 52). Not surprisingly, most of the sharks represented by the fossilized shark teeth have living relatives, at least at the genus level. However, there are a number of fossilized shark genera which have no modern representatives. There are several *Carcharodon* species which are currently recognized by their teeth, but not as a living species. One of these species of shark is *C. megalodon.*

Sharks comprise an infraclass of the Class Chondrichthyes which characterize fish whose skeletal material is entirely composed of cartilage. Sharks have no bone in their skeleton. According to Case (1982, p. 222), they are a part of the infraclass Elasmobranchii Selachii sensu lato (sharks, skates, rays and sawfishes) which includes ancient and modern sharks and their relatives.

The earliest sharks identified in the uniformitarian fossil record come from the Late Middle Devonian Period (Springer and Gold, 1989, p. 30; Radinsky, 1987, p. 56; Case 1982, p. 222). However, many paleontologists speculate that, due to the evolutionary "precursor" requirements, sharks probably evolved in the Silurian (Stahl, 1985, p. 127). Sharks "appear" fully formed with no apparent ancestors and evolutionists still know little about their origin (Stahl, 1985, p. 176). The "earliest" sharks are considered primitive. However, Romer (1966) has suggested that sharks are more advanced than generally believed. He states:

> . . . sharks are degenerate rather than primitive in their skeletal characteristics; that their evolution has paralleled that of various other fish types in a trend toward bone reduction; and that their ancestry is to be sought among primitive bony, jaw-bearing fishes of the general placoderm type (Romer, 1966, p. 38).

According to Radinsky (1987, pp. 59-65), sharks are much more complex, both in skeletal design and behavior, than previously thought and they have larger brain sizes, in relationship to body mass, than do the bony fish. Evolutionary paleontologists continue to seek ancestors for the sharks; however, the mystery of their origin remains unresolved.

In addition to not having any bone in their skeleton, sharks lack an air or swim bladder. Bony fish use their air bladders to maintain a specific depth within water. Because sharks do not have an air bladder, they are forced to swim to maintain their depth position in seawater. If a shark were to discontinue swimming, it would simply sink to the bottom.

The bony fish can remain motionless and force water through their gills to respirate. However, most sharks lack the means of forcing water over their gills and are

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forced into constant forward movement in order to respirate. Constant movement, therefore, maintains the shark's depth within the water and its ability to respirate. It should be noted that not all sharks require movement to force water over their gills and breath. A few species can actually remain motionless and force water over their gills (e.g., the nurse shark). However, the vast majority of sharks, including the great white, must move constantly in order to force water through their gills to exchange oxygen to survive.

Sharks are usually identified by their dermal denticles and their teeth. Ellis (1976, p. 31) described the dermal denticles as:

> "Skin-teeth" is a good translation, and this is exactly what they are. They have the same basic construction as the teeth of the shark, in that they are covered with dentine and they have a central pulp canal. The denticles are not the skin of the shark, but are embedded in it. They have a wide base, a narrow "neck," and then the platelike outer surface. In some species the denticles are closely spaced and overlapping, while in others they are spaced more widely apart. Even the distance between them can serve as a species determinant . . .

Shark teeth are also believed to be species specific and serve as a means of species identification. These teeth are continuously lost and replaced by underlying rows of teeth (usually in a few days!). This tooth replacement process continues throughout the shark lifetime. In several instances, shark teeth have been found embedded in various objects (wooden boats, attack victims bones, dinosaur bones, etc.) and the species in question was quickly identified based on the lost tooth. What leads many scientists to believe that C. *megalodon* and C. *carcharias* are the same shark species is their similar tooth morphology.

Carcharodon megalodon

Teeth from the genus Carcharodon are found in deposits which "date" to the uniformitarian Upper Cretaceous Period (Randall, 1973, p. 170). However, the *Carcharodon megalodon* shark teeth are first identified in strata dated to the uniformitarian Miocene Epoch (Case, 1982, p. 272; Maisey, 1987, p. 16) [Figure 2]. Based on tooth size, C. *megalodon* has been estimated to range up to 100 ft. in length. However, recent and more reliable studies have concluded that this species probably did not exceed 43 to 45 ft. in length

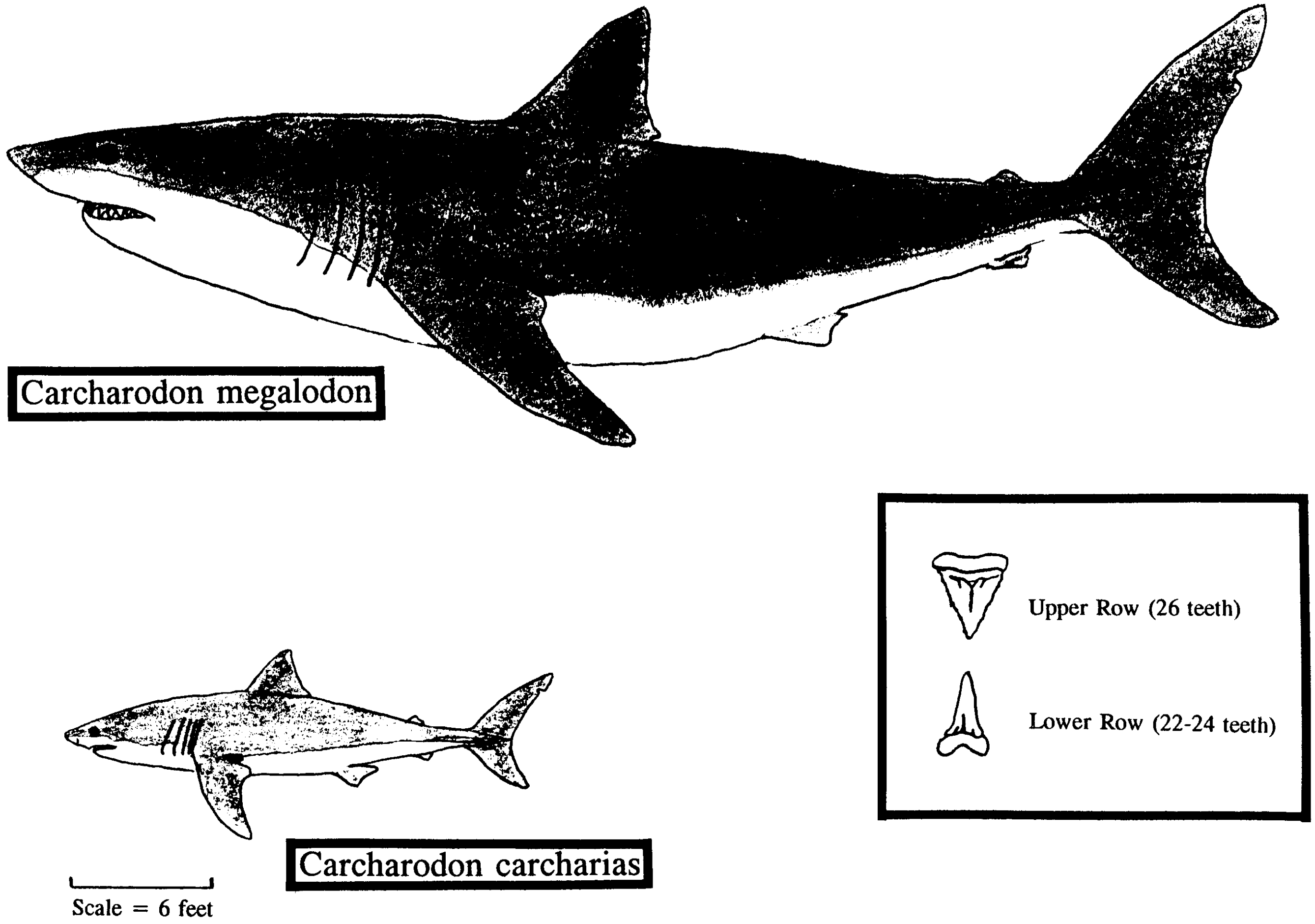

Figure 1. A comparison between *Carcharodon megalodon* and *Carcharodon carcharias*. The scale is the same for both sharks, with the *C. carcharias* being approximately 19.5 ft. long and *C. megalodon* being approximately 45 ft. long. Teeth in both species are very similar, with the major difference being one of size. Modified after Ellis (1976, p. 89), and Castro and Stone (1983, p. 89).

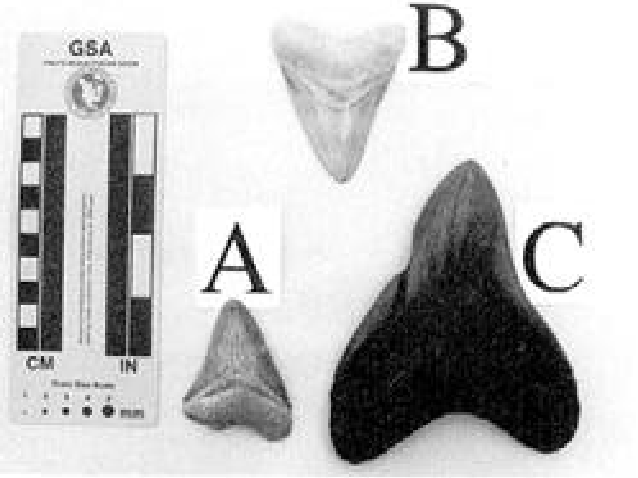

Figure 2. A comparison between the fossilized teeth of *Carcharodon megalodon.* If the three teeth shown represent the center and largest teeth in the shark then these teeth represent: (A) a *C. megalodon* shark approximately 14-15 ft. long, (B) a *C. megalodon* shark 18-19 ft. long, and (C) a *C. megalodon* shark approximately 36-40 ft. long (all based on Randall, 1973). Tooth (B) is approximately the same size as would be found in the largest great white ever captured (Western Australia) [Springer and Gold, 1989, p. 107]. Tooth (C) is from the Cooper River in South Carolina and teeth (A) and (B) are from Polk County, Florida. All three are from the uniformitarian Miocene Epoch.

(Springer and Gold, 1989, p. 50; Ellis, 1976, p. 17; Randall, 1973, p. 170; Maisey, 1987, p. 161.

Megalodon is thought to have "evolved" during the uniformitarian Cretaceous to Eocene and to have become extinct sometime between 30 million to 50 thousand years ago (Ellis, 1976, pp. 26, 102). This extreme range in time for both evolution and extinction is the result of subjective "dating," which is based on "first" and "last" appearance of teeth found in strata dated within those timespans.

The Great White Shark

Great white sharks (i.e.. *Carcharodon carcharias)* are believed to live for approximately 25 to 30 years (Cousteau and Richards, 1992, p. 109) and will vary in length depending upon the ocean in which they live (Springer and Gold, 1989, p. 107). According to Springer and Gold (1989, pp. 106-107):

> Slower growth is reported for the species in Atlantic waters, 20 cm (7.9 in.) per year, compared with estimates of 25 cm (9.8 in.) to 30 cm (11.8 in.) per year for younger, and 21.8 cm (8.6 in.) per year for older individuals from the Pacific. (Parentheses mine)

White sharks in Australian waters are generally believed to grow a foot a year with males reaching maturity when they are 10 ft. long and females when they are 13 to 14 ft. long (Cousteau and Richards, 1992, p. 103).

The largest great white shark ever captured, measured, and weighed was taken off Cuba, and it reportedly measured 21 ft. and weighed 7,302 lbs. (Lineaweaver and Backus, 1970, p. 107). However, photographs of this shark were reevaluated in 1987 and show conclusively that the shark was no more than 16.4 ft. long (Springer and Gold, 1989, p. 107). Other reported sightings of larger great whites have been made, but no one has captured a white shark larger than one from Western Australia measuring 19.5 ft. long (Springer and Gold, 1989, p. 107).

Giantism in the Past

Uniformitarian scientists have suggested that many different reptilian life forms reached tremendous sizes during the uniformitarian Mesozoic Period. Ellis (1976, p. 101) states:

> . . . many living creatures can number among their ancestors gigantic versions of themselves. Some that come to mind immediately are *Deinosuchus,* a fifty-foot crocodilian of the Cretaceous Period, and *Archelon,* a twelve-foot-long turtle. There are many other examples of giant ancestors of smaller descendants, but the progression from larger to smaller does not automatically obtain.

The fact that they grew to such large sizes and are no longer found on earth presents a mystery for paleontologists, biologists, and zoologists.

Evolutionary paleontologists now recognize that the dinosaurs, being reptiles, continued to grow until their death (Horner, 1988, p. 84; McGowan, 1991, p. 127). A difference of opinion still exists on whether the dinosaurs were warm-blooded, cold-blooded or both at different stages in their life. This difference, whether they were warm or cold-blooded, affects the amount of time that it would take to "grow" a big dinosaur (Bakker, 1986, p. 349). If the dinosaurs were cold-blooded, like their modern reptilian counterparts, they could subsist on less food and would grow at very slow rates; hence a very large reptile would require many years of growth. Long periods of time (i.e., from 100 to 200 years) have been proposed for a baby dinosaur to grow to adult size (see Case, 1978, pp. 320-328; McGowan, 1991, p. 128). It has also been suggested that cold-blooded dinosaurs could initially grow rapidly and still live for very long periods of time (Lessem, 1992, pp. 157-158). Many dinosaur bones exhibit "growth rings" which can be used to approximate their age (Monastersky, 1994, p. 312). This author suggests that total dinosaur size development required long periods of time, which are reflected in the bone "growth rings" and are reinforced by their large size. This is based on the author's belief that the dinosaurian "kind" were ectothermic (i.e., cold-blooded). While growth would continue throughout the dinosaur lifetime, it would be limited by the genetic code which would set its maximum growth potential. Hence, the "growth" rate would slow with age to the point where very little growth would continue to occur and this would limit the size of the animal.

This principle of a genetic limit to size along with the slowing of the growth rate with age, also appears to hold true for sharks. Springer and gold (1989, p. 60) reported that sharks never stop growing throughout their lifespans. The approximate age of any shark can be determined by counting the growth rings found in its cartilaginous skeleton (Pike, 1991, pp. 109-111;

Springer and Gold, 1989, p. 45; Parsons, 1993). Great white sharks also exhibit growth rings in their vertebral cartilage, and the rings can be used to determine the approximate age of the shark (Cousteau and Richards, 1992, p. 109; Welden, Cailliet, and Flegal, 1987; Cailliet, Natanson, Welden, and Ebert, 1985). Sharks are known for their initial rapid growth rate while still juveniles and a slower rate after reaching maturity (Pike, 1991, pp. 109-111), and great whites are no exception. The larger and more mature the shark, the lower its metabolism and the smaller its food intake (Lineaweaver and Backus, 1970, p. 112; Wetherbee, 1991, p. 76). While mature great whites feed on large animals (e.g., dolphins, seals, tuna, and other sharks), they do not appear to feed often. Great white sharks are not warm-blooded, and their metabolism and growth rate reflect this fact. Hence, it takes a long time for a big great white shark to develop (see Welden, et al., 1987, p. 309, Figure 2).

The fact that no C. *megalodon* skeletons have been found is believed to be due to its cartilaginous composition. Hence, any attempt to determine the age of *C. megalodon* by counting growth rings in its vertebra is not possible. All that remains in any attempt to understand the size and age of the *C. megalodon* shark rests squarely on extrapolating information (e.g., age, growth rate, and tooth size) from the modern C. *carcharias* shark and estimating it with that of the extinct(?) C. *megalodon,* based soley on tooth size.

Present studies raise serious questions regarding the growth potential of *C. carcharias* to that of *C. megalodon.* Work performed by Welden et al., (1987) and Randall (1973) suggests the maximum size attainable for *C. carcharias* as being approximately 24.6 to 26 ft. in length. This raises serious questions about whether these are in fact the same **species** of shark.

Other Influences

Many factors potentially affect the growth rates observed in sharks. Some of these factors include: water temperature as a function of both depth and latitude, destructive mutations (genetics), diet, sex, species, and seasonal variations in temperature. All of these factors affect the age and growth potential of any shark in the wild. Some of these factors could result in the actual demise of a species.

In addressing the disappearance of *C. megalodon,* Ellis (1976, p. 101) states:

> Any solution to the problem of *megalodon's* disappearance is speculatory at best, but we can assume that it had to do with the availability of prey, climatic changes, continental drift, evolutionary variation, probably some still undiscovered factors, and undoubtedly a combination of all these elements.

Sharks are known to grow to larger sizes in the northern latitudes (Parsons, 1993, p. 27) and / or at great depth due to the colder water temperatures. For example, large (up to 23 ft. long, which is larger than the normal length of 13 ft. [Pope, 1973, p. 60]) Pacific Sleeper sharks have been recorded on camera at depths of 4,000 to 6,000 ft. off of Baja California (Clark and Kristof, 1991, p. 79).

Much of the deep waters of the Earths oceans remain to be explored. Hence, it should not be ruled out that *C. megalodon* might still exist in its deep and dark waters. The reader is reminded that in 1977, a Japanese fishing boat hauled aboard what many believe were the rotting remains of a plesiosaur (see Taylor, 1990, pp. 225-226; 1991, pp. 106-107). These creatures are believed to have become extinct many millions of years ago. Man continues to find creatures once deemed "extinct" based solely on the lack of fossils found in strata exposed at the earths surface (e.g., the coelacanth fish, the *Lingula* brachiopod, etc.)

Discussion

Sharks appear fully formed in the fossil record with no likely candidates for ancestors. They are similar in form and function to "modern" species. As creationists, we accept the fact that these sea creatures were created on Day 5 (Genesis 1:20-23).

Sharks as a group are well suited to their environment despite the fact that they have no air bladder or bone in their skeleton. They constantly cruise both fresh and marine waters (some species live in fresh water and several species can live in brackish water) and generally feed on the sick and injured. Many species live or long periods of time while maintaining a constant supply of teeth.

Carcharodon megalodon represents a species of shark that some suggest is alive today in the form of *C. carcharias.* Because shark classification is based on limited morphology (i.e., dermal denticles, and teeth), it is somewhat difficult to imagine an animal with two different sizes of teeth being classified as distinct species. However, others see differences between the teeth as clearly reflecting a difference in species. Ellis (1976, p. 102) has addressed this as:

> The teeth of megalodon (and of other extinct members of the genus *Carcharodon)* are oversized replicas of the teeth of the only living member of the genus— *Carcharodon carcharias,* the great white shark. The differences mentioned earlier (smaller serrations, the dark triangular area between the base and the blade, and the size of the fish), are enough to differentiate the sharks on the species level, but gross morphological characteristics (larger serrations, triangular shape) are sufficient to suggest a very strong relationship between the extinct *megalodon* and the recent *carcharias.*

However, if these two sharks were in fact different species, how did *C. megalodon* then grow so large?

Many creationists believe that both mankind and creatures lived for longer periods of time during the Antediluvian timeframe than today (see human lifespans in Genesis 5). If man lived for several hundred years, it should not be inconceivable to believe that creatures also lived a longer proportional lifespan. For example, if man lived to be 500 years old, a dog could live a proportional length of time of approximately 107 years (500 divided by 70 [average human lifespan] times 15 [average dog lifespan]). A great white (i.e., *C. carcharias)* could have lived for 214 years and *C. megalodon* possibly even longer.

Based on current growth curves for great white sharks (see Welden, et al., 1987, p. 309, Figure 2), it is not likely that *C. carcharias* could grow to the sizes estimated for *C. megalodon,* even if it lived for 214 years. Hence, this would suggest that *C. megalodon* is indeed a separate and distinct species of shark. Being a separate shark species capable of growing to such a large size, the next issue would be how it achieved such great size.

The Antediluvian timeframe of 1000 to 2000 years before the Flood would have allowed *C. megalodon* to continue to grow for very long periods of time and reach its maximum size potential of 44 to 46 ft. Similarly, dinosaurs could also grow to be very large in the Antediluvian over the hundreds of years in which they lived. The longer growth periods proposed for the Antediluvian timeframe could solve the "giantism" issue currently debated by paleontologists.

Conclusion

This author proposes that the prehistoric (i.e., Antediluvian) shark *C. megalodon* is apparently not the same shark species as the modern *C. carcharias* (white shark). This belief is based on the differences of estimated sizes which the *C. carcharias* can achieve. The fact that C. *megalodon* is estimated to have grown up to 20 ft. longer than C. *carcharias* tends to support this concept. The author suggests that C. *megalodon* simply lived longer during the Antediluvian timeframe and grew to its maximum size potential, much like the dinosauria.

Ellis (1976, p. 102) has suggested:

> We can therefore assume that the considerably enlarged body of *megalodon* was close in form to that of *carcharias. Megalodon* probably had the same fusiform, tapering body, the same flattened caudal keels, and the same homocercal tail lobes. Extrapolating from the proportions of a large white shark, we can deduce that a 45-foot *megalodon* would have had a tail that was almost 15 feet high, pectoral fins 8 feet long, and a dorsal fin that stood 6 feet tall.

Because the world's oceans remain for the most part unexplored, it would be unfair to assume that *C. carcharias* do not grow to their maximum attainable size (approximately 24 to 26 ft.). Researchers working around the world have reported seeing great white sharks 20 ft. long and longer (Cousteau and Richards, 1992, p. 123; Ellis, 1976, p. 97; Randall, 1973, p. 170). However, present studies seem to indicate that C. *carcharias* cannot grow to the size (i.e., 45 ft.) suggested for that of *C. megalodon*. This leaves us with the realization that *C. megalodon* apparently was a separate and distinct species of shark. However, would it be true to say that *C. megalodon* does not exist just because we do not find its teeth in rocks "dated" to the "recent?" Probably not. Many "living fossils" have been found within the last 100 years and this author suggests the possibility that many remain to be found. Perhaps *Carcharodon megalodon* still exists within the depths of the oceans.

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MID AND HIGH LATITUDE FLORA DEPOSITED IN THE GENESIS FLOOD PART II: A CREATIONIST HYPOTHESIS

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Abstract

A creationist hypothesis for mid and high latitude paleofloras, including the fossil "forests" on Axel Heiberg Island, is presented. This hypothesis is an extension of the floating log mat model during the Genesis Flood. One ramification of this hypothesis is that most of the "Cenozoic" land sediments likely were deposited in the Flood and not the post-Flood period. Several other applications of this model are presented.

Introduction

In Part I of this article, warm-climate paleofloras were documented at mid and high latitudes. Special attention was paid to the warm paleoflora of Axel Heiberg and Ellesmere Islands at about 80°N latitude. Paleoclimate simulations indicate cold winter temperatures at high latitudes and at mid latitudes within continental interiors. Several explanations for resolving this uniformitarian paleoclimatic paradox were discussed and shown to be inadequate.

In Part II, I will suggest a creationist hypothesis for paleofloras, especially those in the Queen Elizabeth Islands. The floating log or debris mat model seems the most favorable for explaining the paleofloras. This hypothesis can be extended to questions of the placement of the Flood / post-Flood boundary and whether there is geological evidence for a vapor canopy. The floating debris model can also be applied to such questions as the rapid replenishing of vegetation on the earth after the flood, dinosaur footprints in coal, and insects in amber.

A Creationist Hypothesis

How would creationists explain warm climate paleofloras, including fossil "forests," at mid and high latitudes? There are two possibilities: 1) they formed during the Genesis Flood from a floating mat of logs and plant debris (Woodmorappe, 1978; Coffin, 1983; Austin, 1987), or 2) they formed soon after the Flood when the Arctic, North Atlantic, North Pacific, and Antarctic Oceans were much warmer Oard, 1990, p. 72-75).

In the second possibility, the oceans right after the Flood could be as warm as 30°C from top to bottom and pole to pole. The Arctic Ocean would be relatively warm for a few hundred years Oard, 1990, p. 199-215). The high latitude oceans would cool fast during a post-Flood rapid Ice Age, but even when surface temperatures dropped to near freezing, just the lack of sea ice would still cause northern Canada to be about 20 to 30°C warmer in winter than today (Newson, 1973). The warmer ocean would potentially allow trees and plants from a warmer climate to grow at higher latitudes.

Although my Ice Age model possibly may explain the cooler climate vegetation pigeonholed into the late Tertiary Beaufort Formation on the Queen Elizabeth Islands, I believe the floating plant debris model explains most of the paleofloras and the fossil "forests" at mid and high latitudes. I vacillated on which model to accept for awhile, because there are features that favor each. For instance, the upright, mummified stumps and the compressed, well-preserved leaf litter on Axel Heiberg Island would tend to favor in situ post-Flood growth. These trees could possibly survive a period of darkness, according to a new study by Read and Francis (1992), who subjected seedlings from taxa fossilized during the Cretaceous and Tertiary at high southern paleolatitudes to six weeks of darkness. They found most of the taxa could tolerate the darkness, especially if the temperatures were cool but above freezing.

There are at least three reasons that overwhelmingly favor the floating plant debris model. First, climate simulations show that even with warmer polar oceans, the interior of mid and high latitude continents would be cold in the winter (see Figure 5 in Part I). Besides, the Ice Age would develop *immediately* after the Flood due to a warm ocean and volcanic dust and aerosols in the atmosphere (Oard, 1990). Therefore, it would be too cold for subtropical plants and animals in Montana, Wyoming, Washington, Axel Heiberg Island, Alaska, and other areas immediately after the Flood.

Second, Figure 3 in part I from Axel Heiberg Island shows repeating leaf layers among flat strata that are reminiscent of coal cyclothems (Woodmorappe, 1978). The sequence looks like it was laid down by three-dimensional sheet flow over a large area. Horizontal and evenly-laid beds of compressed vegetation with several layers of upright tree stumps indicate burial in the Genesis Flood, probably in the late stages. The fact that the leaf litter and the horizontal logs were significantly compressed indicates much overburden had accumulated. Then large scale erosion as the Flood waters drained left remnants of the sequence. I would expect post-Flood forests to grow on slopes, even on a "flood plain." Flat surfaces do not exist in modern peat swamps because there are surface undulations caused by stream channels and local high areas (Morris, 1994, p. 102). I would also expect post-Flood erosional and depositional patterns to be linear and not three dimensional. A much smaller amount of erosion would be expected in the post-Flood climate. Therefore, the leaf and upright tree layers are very likely from the Genesis Flood and not due to post-Flood warmth.

A third significant fact is that the leaves and twigs in the compressed leaf litters are just as well preserved at the *bottom* of each bed as at the top. There is also no evidence of bacterial or fungal decay of the leaf litter (Obst et al., 1991, p. 123), although a large variety of fossil fungi spores and propagules have been recovered from the leaf mat (Day, 1991). If this were an in situ leaf litter, even in an anaerobic swamp, the bottom vegetation should have shown some evidence of decay

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after hundreds or thousands of years. Greenwood and Basinger (1993) estimate the leaf layers accumulated at about 10 cm per 50 to 100 years. Some of the leaf layers they estimated to have accumulated in 2000 years. Therefore the leaf litter is not the top of a soil profile, but was deposited rapidly, which would occur in the floating debris model and not in a post-Flood warm climate.

Floating Debris Model for Axel Heiberg Island "Forests"

Here is a more detailed summary of how I believe the successive leaf litters and "forests" on Axel Heiberg Island originated. At the beginning of the Genesis Flood, huge masses of vegetation were removed from the land. This vegetation floated and drifted all over the world on rapidly moving currents (Baumgardner and Barnette, 1994). Trees and other plant material from warm climates were carried to mid and high latitudes. Sometimes, vegetation from warm and cool climates would mix before sinking. This would result in the occurrence of trees and plants from widely divergent climates and habitats mixed together in the same deposit or area. The fact that marine fossils are also found in the Eureka Sound Formation is evidence in favor of the floating debris model.

Logs rubbing against logs would strip the bark, adding to the debris layer below (Austin, 1987). This would account for the fact that few fossil trees in the world have any remnants of bark. The trees on Axel Heiberg Island have only rare patches of bark (Francis, 1991, p. 33).

Among the floating debris were dead animals, floating either of their own accord or kept afloat by being entangled within thick plant debris. It is likely that many animals, insects. and birds were living for awhile on the floating plant debris. Associated animals in the floating plant debris could account for the warm-climate vertebrate fossils found associated with the peat layers on Ellesmere Island (Estes and Hutchison, 1980; McKenna, 1980). Since all these warm climate flora and fauna could have *floated* to higher latitudes, a warm polar pre-Flood climate is not required.

Some of these trees likely floated upright, as shown by Coffin (1983) and Austin (1987). Both upright floating trees and horizontally floating trees could still have leaves, cones, and fruits attached above water. These would gradually fall, producing fresh, well-preserved fossil floras. Many of the trees would eventually become waterlogged and sink. The mummified trees on Axel Heiberg Island are waterlogged. The fact that most of the leaf litter and probably most of the upright trees in the Geodetic Hills are *Metasequoia* and *Glyptostrobus* could be because these trees flared at their base. Consequently, they would more easily float upright while most of the other trees would more likely float horizontally.

Towards the end of the Flood, masses of plant debris and trees were trapped in large bays of the Queen Elizabeth Islands as the islands were rising out of the Flood waters. The trees and vegetation were sinking while massive erosion from the uplifting Princess Margaret Arch in central Axel Heiberg Island was occurring and forming the Eureka Sound Formation. While trees and plant debris were sinking, pulses of sedimentation were occurring along the bottom. Little accumulation of plant material would occur during rapid deposition of conglomerate and sandstone near the uplift area. In eastern Axel Heiberg Island, the sediments are more fine grained. Here, trees and leaf litter would especially accumulate during lulls in sedimentation. So, leaves, cones, seeds, and fruits, sometimes with upright trees, would repeat in a vertical sequence. A similar model is proposed by Coffin (1983, pp. 134-151) to explain the repeating fossil forests in Yellowstone National Park. The fact that some of the trees and plants in Yellowstone Park are from tropical climates (Coffin, 1983, pp. 138, 139) favors a log mat model during the Flood and not post-Flood catastrophism. The log mat model is favored because the early post-Flood climate would be cold in the interior of North America due to its interior geography and a shroud of volcanic dust in the stratosphere (Oard, 1990).

Evidence that the floating debris likely was continuously sinking in eastern Axel Heiberg Island is shown by the traces of plant remains in the conglomerate facies (Bustin, 1982, p. 142). The sediments between the leaf layers are vertically graded and do contain a fair amount of plant material (Francis, 1991b, p. 43).

Further evidence for the floating debris model for the successive leaf and log layers on Axel Heiberg Island is the discovery that one large tree had no roots (Greenwood and Basinger, 1993). A few smaller trees had roots, but these were only the large upper parts of the roots. One would expect the smaller parts of the roots, just like the bark, to be broken away while the debris floated during the Flood.

Finally as the land was emerging from the Flood waters, generally horizontal three-dimensional deposition of sediment in the Geodetic Hills gave way to sheet erosion as the Flood waters rushed from off the land. Then, sheet erosion would give way to more linear erosion during the final phase of the drainage process. Thus, valleys and canyons, orientated in the direction of drainage, would be quickly excavated. The Geodetic Hills would then remain as erosional remnants from the final phase of the Flood.

There are a few questions unanswered by the floating debris model for Axel Heiberg Island "forests." One question is why are the trees mummified? Secondly, why are the stumps at most one m tall?

Basinger (1986, p. 35) suggests that the reason the trees are mummified and not petrified and the leaf litter so well preserved is because they were buried rapidly by *silt*. The silt sealed the layers from ground water that would petrify the trees. This seems reasonable since fragments of wood found in the much sandier sediments *between* the peat layers are petrified. However, it is doubtful this mechanism would prevent petrification of the wood and rotting of the vegetation for 45 million years! For a creationist explanation of petrifaction see Williams, 1993.

The uniformitarian explanation for why the stumps are no more than one m tall seems inadequate. The fact that some horizontal logs are up to 10 m long indicates that many of the trees were more than just stumps while floating in a log mat. I suggest the stumps on Axel Heiberg Island were original sheared off near the base by violent volcanic explosions at the beginning of the Flood, similar to what occurred at

Mount St. Helens. The fossil trees in Yellowstone National Park are also stumps at most four m tall.

Discussion

This study has further implication for the Creation / Flood model of earth history as it relates to the Flood / post-Flood boundary. Some creationists have suggested that the "Tertiary Period" is post Flood, for example Howe (1987); Felix (1993); Williams and Howe (1993); Wise, Austin, Baumgardner, Humphreys, Snelling, and Vardiman (1994). Some creationists postulate that part or all of the "Mesozoic" is post-Flood (Northrup, 1987; Scheven, 1990). This study indicates that at least the particular "Mesozoic" and early "Tertiary" sediments on the mid and high latitude continents discussed in this article are Flood sediments and not post-Flood sediments. How can such warm-climate organisms thrive in the cold post-Flood period?

Since some "Oligocene," "Miocene," and "Pliocene" sediments also contain warm-climate paleofloras (Clutter, 1985; Funder, 1985; Cronin and Dowsett, 1993) and paleofaunas (Hutchison, 1982; Markwick, 1994), much of the "late Cenozoic" land sediments likely are from the Flood, and not from the post-Flood period. For example, the Columbia River Basalt Group, conventionally dated as Miocene, contains petrified subtropical trees (Coffin, 1983, p. 213). Because of the warm-climate plants, the lava is likely from the Flood as suggested by Coffin (1983, p. 180) and not post-Flood as indicated by Austin (Nevins, 1974) and once postulated by Oard (1990, pp. 69, 70). Of course, a Flood interpretation of the Columbia River Basalts introduces other creationist interpretation problems as enumerated by Austin (Nevins, 1974) and Northrup (1974).

Just because most "Cenozoic" land sediments are Flood sediments does not mean that the "Cenozoic" ocean sediments are Flood sediments. Ocean sediments are dated by microfossils, which is quite subjective (Tosk, 1988). Uniformitarian oceanic dating schemes need to be evaluated *separately* from land plant and animal index fossil dating. Oceanic organisms do show early "Cenozoic" warmth and cooling in the late "Cenozoic," just like the land paleofloras. There is reason to believe the land paleofloras are made to show this cooling trend due to circular reasoning—by pigeonholing paleoflora from isolated outcrops into paleoclimatic cooling slots. However, the oceanic microfossils could be due to the warmth of the Floodwaters and the cooling of a universally warm ocean during the post-Flood Ice Age (Oard, 1990, p. 71).

The floating debris model likely has many other implications within the Creation / Flood model. One of these is that the geological argument for a vapor canopy may not be sound. This geological evidence consists of the warm-climate paleofloras and paleofaunas that are found as fossils at high latitude and at mid latitudes within continental interiors. According to the hypothesis presented in this paper, warm-climate plants and animals did not necessarily live at high latitudes before the Flood. They may have simply floated to higher latitude during the Flood and been preserved fresh. Therefore, a vapor canopy that keeps the higher latitudes warm before the Flood is not necessarily required by the geological evidence.

Another application is that some of the floating debris likely *survived* the Flood. Specifically, some of the floating debris was not deposited within Flood sediments, but was dropped on the land as the water drained at the end of the Flood. Well preserved fossil cones, seeds, and fruits in the sediments suggest they floated above the water in the debris mat. It is then conceivable that some cones, seeds, and fruits would be deposited on the muddy land without being decayed by possibly corrosive Flood waters. Therefore, they would easily sprout and rapidly spread over the land immediately after the Flood. They need not have survived an extended period of submergence in water.

The floating debris model could also explain the fact that dinosaur footprints are sometimes found in coal. If Flood sediments were periodically exposed during the Flood (Oard, 1995), it is likely that layers of this floating debris would be deposited on the land surface in places. Floating dinosaurs embarking on this land would sometimes step in the deposited debris. The Flood waters rising and depositing more sediments would preserve the imprint and turn the vegetation with the footprints into coal.

The "lignite" beds on Ellesmere Island also contain abundant amber (Dawson, 1975, p. 114; Riediger and Bustin, 1987, p. 135). The floating debris model could account for this amber, as well as the insects within the amber found in many places of the Northern Hemisphere. Interestingly, scientists do not know exactly how amber is formed (Poinar, 1992). Amber supposedly must be resistant to decay for a long period of time, according to the uniformitarian model (Poinar, 1992, pp. 12, 13). It apparently forms similarly to coal and is often found in low grade coal or lignite. Insects are often associated with fossilized plant debris (Becker, 1961; Matthews, 1987). Heat and pressure appear necessary (Poinar, 1992, p. 13). Also, all known amber is found within marine sediments. There is a problem of how insects, which often have their legs and wings extended, become trapped in amber. The trapped insects are similar to those of today, showing little or no supposed evolution (Whalley, 1992).

In the floating debris model during the Flood, it is conceivable that resin was oozing from trees within the floating debris. Insects living in the debris would land or walk into the resin which is sticky enough to trap them, but not so viscous that they cannot spread their wings. Then as the debris sinks to the bottom, the resin falls also. The resin then changes into amber due to heat and pressure from the accumulating overburden. A special kind of resin resistant to decay for millions of years is not required.*

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*Editor's Note: Readers maybe interested in a recent series on petrified wood and charcoalified wood that appeared in *CRSQ* as well as the paleoenvironmental conclusions reached in this series. See Williams and Howe 1993 Part I, Williams 1993 Part II, Williams *et al.* 1993 Part III and, Williams *et al.* 1995 Part IV.

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CRSnet — An “online network” of CRS members

Those members who use computers for e-mail via a commercial online service or the Internet may now use the information superhighway to communicate with each other. Glen Wolfrom is coordinating this effort by assembling a directory of participants, listing their e-mail addresses and areas of interest. This service will also be used to keep members informed about CRS activities.

Send e-mail message to Glen at:
Internet: **CRSnetwork@aol.com** America Online: **CRSnetwork**

PANORAMA NOTES

Botanical Research Highlights

My students review current articles as an assignment in botany class. Sometimes they discover scientific studies that have a bearing on origins and I have adapted sections from seven of these reviews for *CRSQ* readers. The author(s) and other bibliographic data are given first for each research item and the name of the student reviewer is provided at the end, in brackets.

Jacob, W. J. 1994. *Caulerpa. Scientific American* 271(12):100-105.

If a riddle were posed, "What macroscopic plant is composed of just one cell?," the answer would be *Caulerpa! Caulerpa* is a unicellular coenocytic marine green alga but it grows to macroscopic dimensions. Although the whole plant is just one cell, it produces generous "organs" resembling the leaves, stems, and roots of multicellular plants. It responds to gravity by a mechanism involving little amyloplast organelles that help its "roots" grow downward and its "stems" upward. The author performed many fascinating growth and differentiation experiments with *Caulerpa* and billed it as the "world's largest single-celled plant." It is our opinion that *Caulerpa* is an outstanding example of the Creator's versatility. [Benjamin Harm]

del Moral, R. and D. M. Wood. 1993. Early primary succession on a barren volcanic plain at Mount St. Helens, Washington. *American Journal of Botany* 80(9):981-991.

This article illustrates the fact that ecological succession is occurring in an area that was devastated by a major volcanic catastrophe in 1980. At a site called "The Plains of Abraham" on the mountain's eastern edge, del Moral and Wood have recorded 41 different plant species present as of 1992. They determined various vegetational parameters such as species richness, percentage of cover, diversity, and percent of individuals flowering. Most indices of vegetational development have increased steadily during their five-year study (1988-1992). Creationists, of course, will be interested in the rate and patterns by which a previously desolate area is becoming recarpeted with living plants.

These workers noted that some of the "rules" that had been suggested earlier for primary succession were *not* followed here. Previous workers thought that the plant stages of a primary succession would pass through a recapitulation of phylogeny. These earlier workers had supposed that a barren habitat will be populated by a series of organisms that are successively higher in the scale of macroevolution (e.g., fungi, mosses, ferns, and finally flowering plants). The authors took issue with this idea however, noting that succession at Mt. St. Helens ". . . has not recapitulated phylogeny" (p. 989). They indicated that lichens, fungi, and cyanobacteria (which ought to have appeared early, if phylogeny were being repeated) were not present at all. Furthermore, ferns were only sporadic at Mt. St. Helens and the moss species (phylogenetically "early") arrived *after* the vascular plants! [Jon Balsbaugh]

Tsuyuzaki, Shiro. 1994. Fate of plants from buried seeds on Volcano Usu, Japan, after the 1977-1978 eruptions. *American Journal of Botany* 81(4):395-399.

Ever wonder what happens to the vegetation after a volcano erupts? Are plants even alive and able to grow or is the soil so covered with volcanic ash that they get choked out? Shiro Tsuyuzaki in Japan spent 10 years researching this topic, after the eruptions on Mount Usu, located in northern Japan.

Mount Usu emitted volcanic ash and pumice, a spongy form of volcanic glass, onto the surrounding area to a depth of three meters, destroying the above-ground vegetation.

After the eruptions, water erosion occurred, causing gullies to be created in the crater basin. Once the gullies formed, original seeds from what he called a "seed bank" became available. So the succession (at least in these gullies) was secondary, not primary. Tsuyuzaki has shown here and in his previous papers that the initial recovery of the flora in such gullies was dominated by previously buried seeds that became exposed by erosion. The reestablishment of life after catastrophes like these is of clear scientific interest to creationists because the Flood may have had a widespread volcanic aftermath. [Julie Mitchell]

Roy, B. A. 1993. Floral mimicry by a plant pathogen. *Nature* 362:56-58.

Here is a pathogenic fungus which reproduces itself by means of floral mimicry. The rust fungus *Puccinia monoica* preys upon *Arabis* species plants (mustard family) by first inhibiting growth of normal *Arabis* flowers. Then the fungus changes the morphology of its host to produce a counterfeit flower which has a very similar appearance to flowers of another, unrelated species of flowering plant. The "flower" (which is no flower at all) attracts insects which land on it "by mistake." Landing on one pseudoflower after another, the insects carry the fungus spermatia to other *Arabis* plants which may contain different mating types of the same fungus and hence the sexual life history of the fungus is completed. The author notes that this growth of fungus inside an *Arabis* host may also inhibit the reproductive success of nearby flowering plants. The fungus performs what might be called genetic or morphological engineering on its seed plant host. We see this as another striking example of God's providence even on behalf of fungus plants. [Mike Czech]

Waterbury, J. B., C. B. Calloway, and R. D. Turner. 1982. A cellulolytic nitrogen-fixing bacterium cultured from the gland of *Deshayes* in shipworms *(Bivalvia: Teredinadae). Science* 221(9):1401-1403.

How can bivalve animals called shipworms live on nothing but cellulose, with no dietary source of protein or nitrogen? Some years ago Waterbury and his colleagues found the answer in the fact that shipworms have a gland (the gland of *Deshayes)* which houses great numbers of a rather newly discovered bacterium.

This was the first find of a bacterium capable simultaneously of fixing nitrogen and digesting cellulose.

These workers compared the symbiosis between shipworm and its bacterium to the *Rhixobium* bacteria which live in the root nodules of certain leguminous plants. "We know of no other animal that harbors a nitrogen fixer as a pure culture in a specialized organ" (p. 1402). They noted that the presence of these two important ecological processes in one bacterial organism was something that ". . . genetic engineers have been trying (unsuccessfully) to combine in a single bacterium" (p. 1403).

We suggest the these naturally occurring cellulytic nitrogen-fixing bacteria, and the shipworm gland that houses them, are both the created products of *Divine* genetic engineering. [Dan Prentice]

Cox, Paul. 1993. Water pollinated plants. *Scientific American* 270(10):68-74.

Several taxonomically diverse water-dwelling flowering plants have unusual mechanisms whereby they carry out pollination in the water. Some have tiny male flowers that travel to the female flowers across the surface of the water, like sailboats. Others send out stringy masses of floating pollen that reach the female flower which also floats on the water's surface. Still others have a mechanism whereby they actually distribute large amounts of pollen under the water. Cox attributes the origin of these fascinating aquatic pollination procedures in otherwise unrelated species to "convergent evolution" (p. 71).

We propose that striking parallelisms like this one fit better with the idea that the Creator employed similar designs when producing water plants in widely diverse and organically separate taxa. The facts support the existence of a *common design* rather than a *common ancestry*. [Abigail Ulm]

Loope, Lloyd, Michael Duever, Alan Herndon, James Snyder, and Deborah Jansen. 1994. Hurricane impact on uplands and freshwater swamp forest. *Bio Science* 44(4):238-246.

The experiment was unexpected, the forces were tremendous, and the predictions were difficult, but Hurricane Andrew offered scientists an exciting view of a gigantic catastrophe. Loope *et al.* decided to study the hurricane's effects on selected plant and animal species of upland forests and associated freshwater swamp forests.

The three southern counties of Florida—Dade, Monroe, and Collier—possess a flora in which more than 60% of the vascular plant species appear to have been of West Indian origin. The understory was very diverse, with approximately 50 woody species, and more than 120 different forbs and grasses, including 20 taxa endemic to South Florida. By chance, a high percentage of the West Indian flora was within the narrow path of this monster storm.

Hurricane Andrew toppled 100 of the 318 mature pine trees in the study area. This removal of the pines created canopy openings in which pine saplings will be expected to recruit into the overstory.

The pineland understory was relatively unaffected by the storm, while 20-30% of the large trees in the hammock forest and in the Long Pine Key were extensively damaged. Thus the canopy cover was reduced to approximately 30% of normal. The worst hit of all seemed to be the tall, large-diameter trees such as the oak. The rare epiphyte plants saw approximately 50% of their species lost.

But there was also some good news. Reestablishment of the forest cover was occurring rapidly. Vines had begun to grow and this would serve to conserve soil moisture. Many palm trees were still alive because they are designed (we would suggest) to resist hurricanes. The cypress trees were beginning to develop new leaves.

There were some trouble spots in this regrowth scenario. Some aggressive exotic plants (such as *Melaleuca)* had been causing problems in these forests. Efforts had been made to control such populations, but because of the hurricane, small branches with seed capsules were dispersed throughout the area.

In a judgmental catastrophe such as the Flood, one would expect winds of hurricane proportions and the subsequent inundation of forests. These studies by Loope and his coworkers on regrowth after Hurricane Andrew may serve as an analogue for some of the patterns of revegetation which occurred after the Genesis Flood. Apparently there can be widespread survival of many plant species after monumental storms. Some plants, like *Melaleuca,* even extend their geographic coverage after catastrophes. There also appears to be a preadaptation (or predesign?) within many of these plants to regrow by various means after catastrophic devastation. Some of them seem to be predesigned for life in the modified post-storm habitat. [Dawson Lange]

George F. Howe*

Dauphin Island, Alabama: Evidence for Rapid Erosion

Introduction

The Uniformitarians propose that most of the sediments exposed on earth's surface date from millions of years ago, with present physical processes being carried back in time with little to no change in rate. However, young earth creationists do not accept this proposal. Therefore we must develop the young earth Creation/Flood "geological" model which explains the geomorphology and corresponding stratigraphic section within the framework of thousands, not millions of years. It is to this end that this paper now describes the rapid erosion presently occurring on Dauphin Island, Alabama. It is this author's opinion that the "tens of thousands of years" of relative island stasis, as is currently suggested by Uniformitarians, does not fit with the physical processes seen shaping the island today. Evidence is presented showing erosion occurring on Dauphin Island, Alabama, as a result of the rapid rise in sea-level (both from subsidence and actual sea-level change). This erosion is best explained using a catastrophic interpretation within the framework of the young earth Creation/Flood model. The rapid changes seen on the island are not predicted by the uniformitarian model, rather Uniformitarians predict small scale

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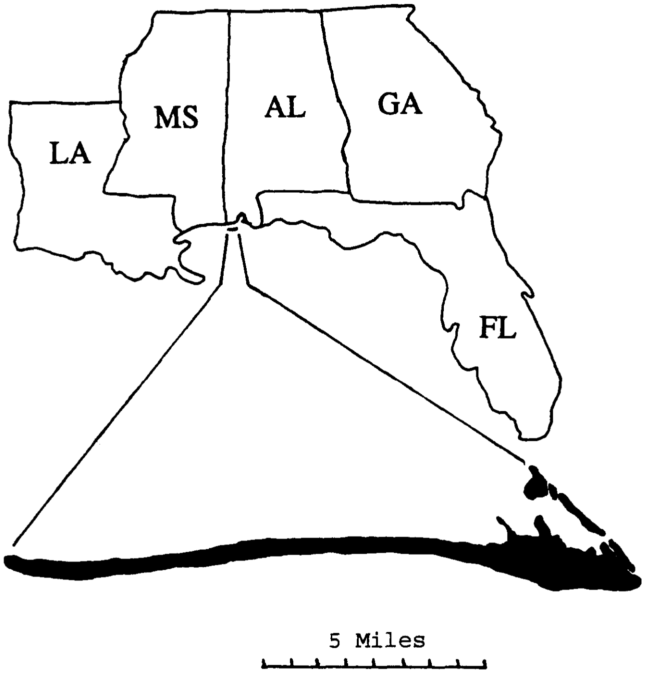

Figure 1. Location map of Dauphin Island, Alabama (Modified from Bennison, A. P. 1975, and Nummedal et al., 1980).

geomorphic changes occurring over tens of thousands of years (Leatherman, 1982, pp. 56-59; Dolan and Lins, 1986, p. 13; Curray, 1965, p. 725).

The author acknowledges that Dauphin Island cannot be taken to represent all barrier islands found along the U.S. eastern and southern coasts. However, it does demonstrate several facts which challenge current uniformitarian models. Many of the ideas presented within this paper are based upon the author's own opinion, using the most reasonable geologic interpretation of events which have occurred in earth's past. Hence, the "testability" of many of these concepts could be limited. However; references are cited to support much of the author's interpretation.

Dauphin Island, Alabama

Dauphin Island, a transgressive, microtidal barrier island, is located five miles off of the southwest Alabama shoreline [Figure 1] (Nummedal, 1983; Leatherman, 1982). According to the uniformitarian geologic timescale, the majority of Dauphin Island is believed to have formed during a sea-level highstand (approximately 40,000 years ago) in the Pleistocene Epoch (Nummedal, 1983; Otvos, 1982). Holocene sands are believed to have migrated landward, driven by both wind and water, due to the rise in sea-level position since the end of the Wisconsin Ice Age (approximately 18,000 years ago). These Holocene sands added to the already existing Pleistocene sands which formed the core of Dauphin Island (Otvos, 1979; 1982; 1985; Nummedal, Penland, Gerdes, Schramm, Kahn and Roberts, 1980). The addition of the Holocene sands are believed to have made the island much longer and wider than it is today.

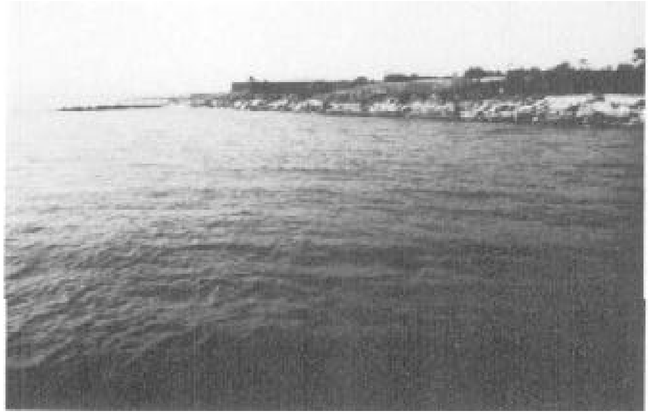

Figure 2. Offshore view of eastern end of Dauphin Island, Alabama. rip-rap has been placed along the shoreline to prevent erosion as sands move from the eastern end of the island towards the west.

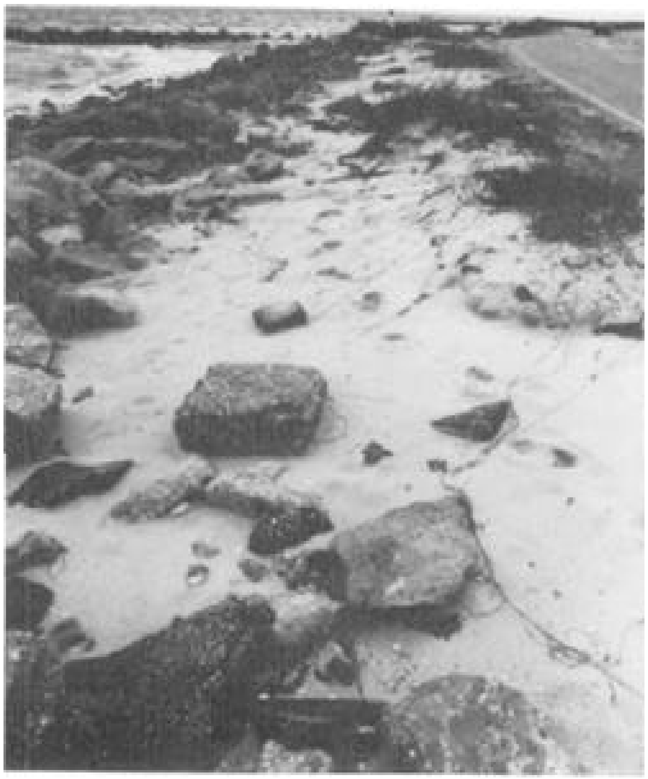

Figure 3. Closeup view of rip-rap along eastern shoreline. Note proximity to road on the right side of photo.

Dauphin Island Today

The modern beachface and shoreline of the island experienced its most severe erosion as a result of the landfall of Hurricane Frederic on Sept. 22, 1979. Additionally, in the ensuing years since Frederic, several hurricanes have passed nearby adding to the erosion of the island. Large amounts of sand, which comprise the island, have been removed from the beachface. The island, approximately 14 miles long, contains both high and low relief dune ridges (see Nummedal, 1983, for complete explanation). The easternmost edge of the island has been covered in rip-rap in an effort to prevent further erosion by wave and tidal forces (Figures

2 and 3). While it appears that the rip-rap is slowing the rate of erosion, if additional sand is not added to the front of the rip-rap, then erosion will continue to the point where the access road around Ft. Gaines will be lost to the Gulf within 15 years (estimated by the author, perhaps even sooner if other hurricanes pass nearby). Additionally, the Mobile Bay ship channel has eliminated any eastward source of migrating sand and this adds to the further erosion of Dauphin Island.

The beachface located all along the south (Gulf of Mexico) side of the island has receded from a pre-Frederic wide and relatively flat surface (approximately 100 to 200 feet wide) to a shortened and more steep face (approximately 50 to 75 feet in 1993) [Figures 4 and 5]. The majority of the sand associated with the shoreline and beachface has not migrated inland. Rather it has moved, via tide and wave action, either into deeper water or laterally. Today the island is moving both to the west (laterally) due to longshore current transport, and landward (thinning), due to eolian and offshore wave transport of the sands.

Both sea-level rise and the island's subsidence are believed, by the author, to be the two most important factors in changing the shape of Dauphin Island. Sea-level rise along the Alabama coastline is generally considered to be 4.75 inches per century (Smith, 1981, p. 25). However, the subsidence rate has not been calculated and its combined effect with sea-level rise remains unknown. Coastal subsidence is now recognized as part of the formula in the destruction of the Mississippi and Alabama shorelines (Foxworth, Priddy, Johnson, and Moore, 1962, p. 23; Smith, 1981, p. 25). Coastal subsidence would create the appearance that sea-level is rising, when it is in fact stable.

Examples of Rapidly Changing Conditions

Dauphin Island presents some very interesting examples of rapidly changing conditions due to regular seasonal cycles, and storm events. These examples reinforce the rapidly changing conditions found on barrier islands and, in the authors opinion, better support the young earth Creation/Flood model than they do the uniformitarian model.

Large blocks of rock (i.e., rip-rap) have been placed along the eastern end of Dauphin Island to stabilize it from further erosion. However, while the rip-rap has slowed the erosion of this end of the island, it has not stopped its progress (Figures 3 and 4). The eastern end of the island serves as a sand source for the shoreline and beachface along the southern side of the island. Longshore currents transport sand laterally along the front of the island. This sand serves to add to the sand budget available for beach development. Without the available sand the beach face suffers loss as the island thins.

Several paleo-maritime forests are being exposed along the south (Gulf of Mexico) side of the island (Figures 6 and 7). The age of the paleo-maritime forest remains subject to debate ("Recent" versus upper Pleistocene) and is believed to reflect a different sea-level position when it flourished (Foxworth, et. al., 1962, p. 23). The fact that a maritime forest once existed in an area currently underwater reinforces the position that sea-level change (possibly as a result of coastal subsidence) has occurred rapidly. The reason for this conclusion is based on the fact that the trees are still composed of wood (no replacement of the wood has occurred) and the roots still hold them firmly in place. Long periods of exposure to the elements (both before and after their burial) would not have allowed for the preservation of the woody material in the migrating beach sands. The atmospheric conditions coupled with insect activity would have reduced this woody material in a matter of centuries, let alone tens of thousands of years! This same type of sandy shoreline, exposing maritime forests, has been reported along the eastern seaboard (Virginia—Leatherman, 1982, p. 52) and other Gulf Coast locations (Florida—Campbell, 1984, p. 18; Mississippi-Foxworth, et al., 1962, p. 22).

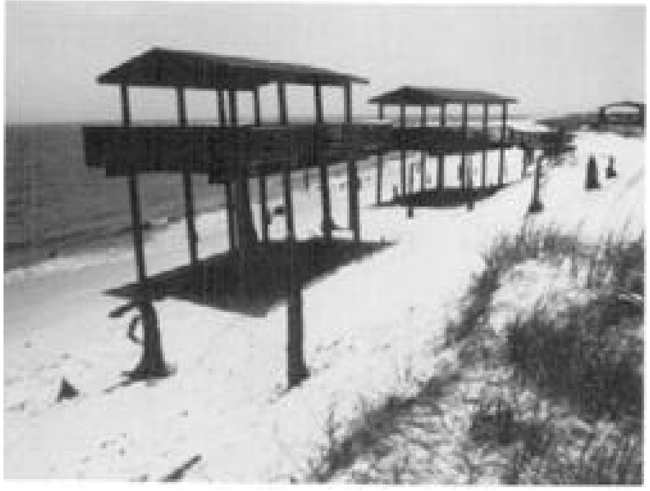

Figure 4. Low tide in June 1993. This photograph reveals tree stumps along the shoreline and the obvious loss of sand beneath the picnic areas. The picnic areas are approximately 12 to 14 feet above the beach.

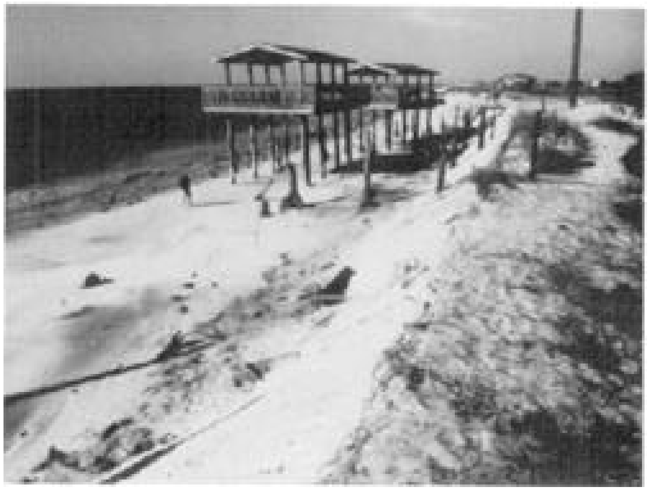

Figure 5. Low tide in January 1994. This photograph shows the more erosive winter cycle of beach erosion. Note considerable landward erosion has occurred since June (compare tree stump positions and beach cliff face). Many more tree stumps are visible during this "winter" cycle. While some sand will be redeposited during the spring and summer cycle, this author does not believe that it will be sufficient enough to stop landward erosion.

A 1000 gallon septic tank was discovered on the beach (Figure 8). Septic tanks, like this one, have been in use on the island since its modern development. The

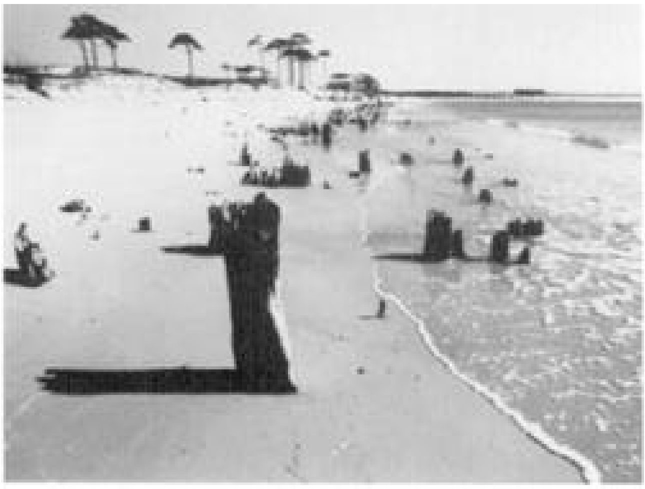

Figure 6. Close up view of paleo-maritime forest exposed along shoreline (low tide—winter cycle). Note tree density and size; this was a heavily wooded hardwood forest. Tree in foreground is approximately 1 foot in diameter.

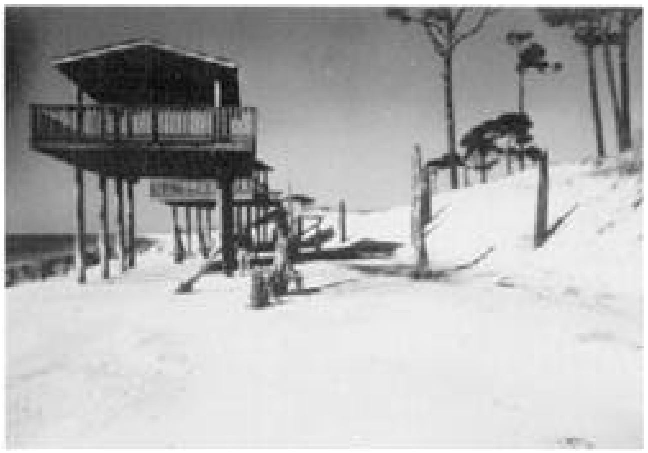

Figure 7. Closeup view showing the beachface between low and high tides. Note high tide rises to the edge of the cliff-face. Storms create severe erosional conditions and rapidly erode the beachface landward. Also note trees on left side of photograph along low-tide shoreline. January 1994.

Alabama Public Health Department requirements for the location of septic tank systems in this area (i.e., close to the beach) would have required a 50 foot distance from the former beach cliff face (Alabama Department of Public Health, 1988, p. 25). With this septic tank exposed as it is, it would be fair to estimate that in approximately 30 years the Gulf side of the island has eroded no less than 75 feet landward, which corresponds to 2.5 feet per year average. Obviously, this is an alarming rate.

Along the beach cliff face it was discovered that a landfill was exposed in cross-section due to landward erosion (Figure 9). This reinforces the idea that barrier islands will eventually expose anything and everything placed on or in them. The clay bricks and pieces of glass examined tended to indicate that they were no more than 25 to 30 years old.

A storm deposit was found exposed in the beach cliff-face (Figures 10 and 11). This deposit is interesting in that it reflects a large storm event. The storm deposit was approximately 5 feet above the present high tide sea-level and extended 50 feet wide by 25 feet deep (it could be traced slicing through the dunes in the dune field). The storm deposit consists of a oyster and clam shell hash with fine grained clay as the matrix (Figure 12). This deposit must date to more recent times (possibly Hurricane Camille, 1968 or Frederic, 1979) because it was deposited above the previously mentioned landfill and after the pre-existing maritime forest was rolled over by transgressing sand dunes and destroyed.

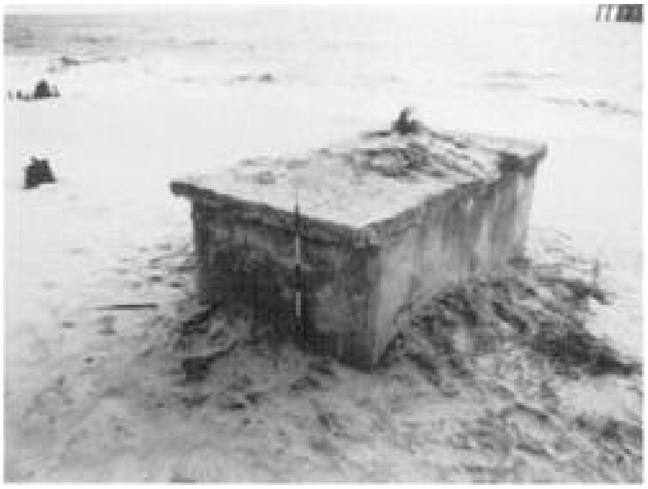

Figure 8. 1000 gallon septic tank. This tank was not exposed during the June 1993 visit to the island. However, the more erosive winter cycle had eroded the sands from around it by January 1994 (a distance of approximately 20 feet). Scale is in 6 inch units.

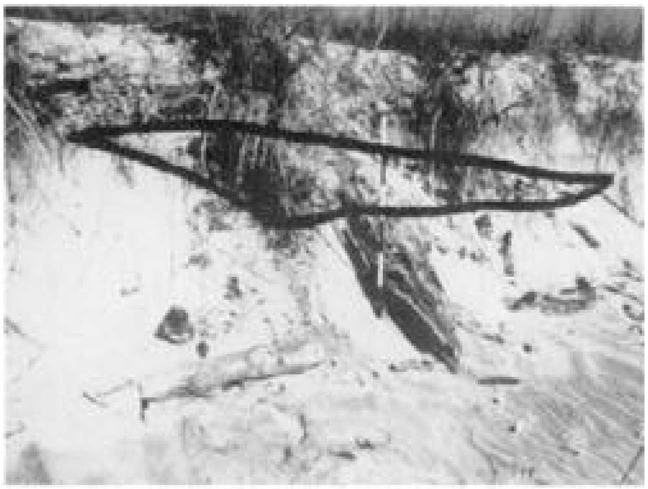

Figure 9. Small exposed landfill. Debris is exposed to the left of the scale. Debris found included bricks, glass, and aluminum cans. Apparently the landfill was ignited and, after burning, was buried. Scale is in 6 inch units.

Conclusions

One very important point which reinforces the rapidly changing conditions? found on Dauphin Island is the fact that a paleo-maritime forest is exposed along the shoreline. Although the uniformitarian scientists believe that barrier islands migrate, they believe that today's barrier island positions are basically where they have been for 4000 years (Dolan and Lins, 1986, p. 13).

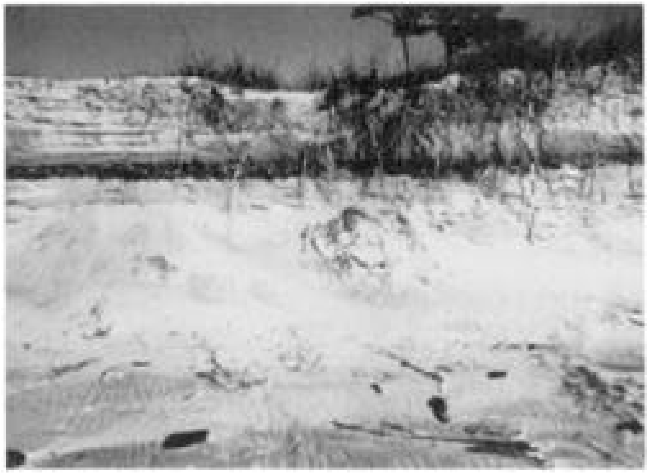

Figure 10. Dark layer is a storm deposit from an unidentified storm. Layer is exposed at beach cliff-face for approximately 200 feet. Scale is in 6 inch units.

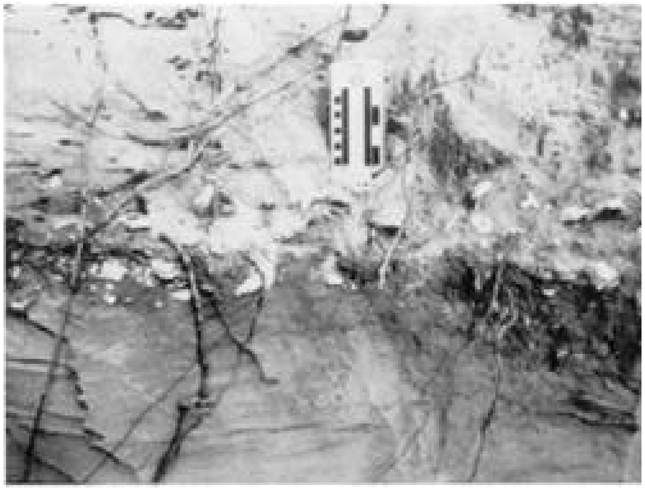

Figure 11. Closeup view of a "shell-debris" storm deposit. The deposit was composed of clam and oyster shells, probably concentrated in the storm waves and eventually deposited in a large storm

Their model does not predict tens of feet of landward erosion within 25 to 30 years. At this rate the majority of Dauphin Island will be eroded within 200 years if nothing is done to prevent it!

Paleo-maritime forest tree trunks, exposed along the shoreline, are in their original upright growing position. Their roots still hold the fossil trees in the place where they grew originally (Figure 13). These trees are preserved in sand, a porous material which would do nothing to preserve the woody material. Migrating sands coupled with insect activity should have destroyed these buried stumps. However, if the sea-level rise were rapid (both from subsidence and a real rise in sea-level) and resulted in the swift erosion of the barrier island, then previously existing maritime forests would be exposed at the shoreline as the island rapidly "moved" both laterally and backward. This is what is observed.

The amount of tree vegetation exposed along the shoreline at Dauphin Island indicates that, in the not

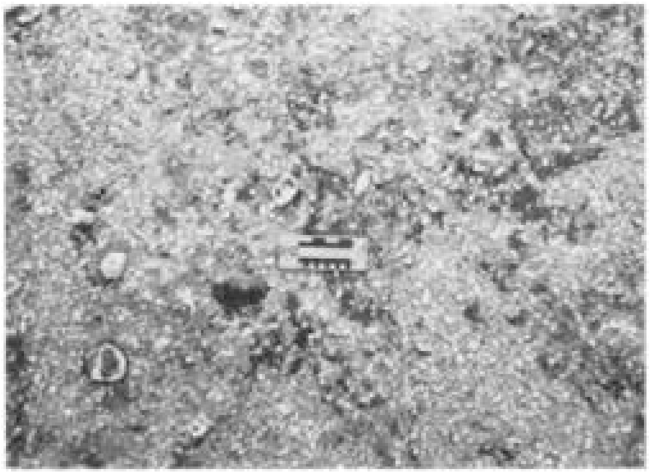

Figure 12. Closeup view of shell debris pavement exposed in interswale area of dune field. Note all the broken pieces of shell material. Shells were deposited in a clay matrix, which reflects the sedimentary composition of materials found in the nearshore area of Dauphin Island. The island is sand starved with most material coming from Mobile bay being silt and clay. The original source area for sands for Dauphin Island was to the east from the barrier islands lying offshore of southeast Alabama and the panhandle of Florida.

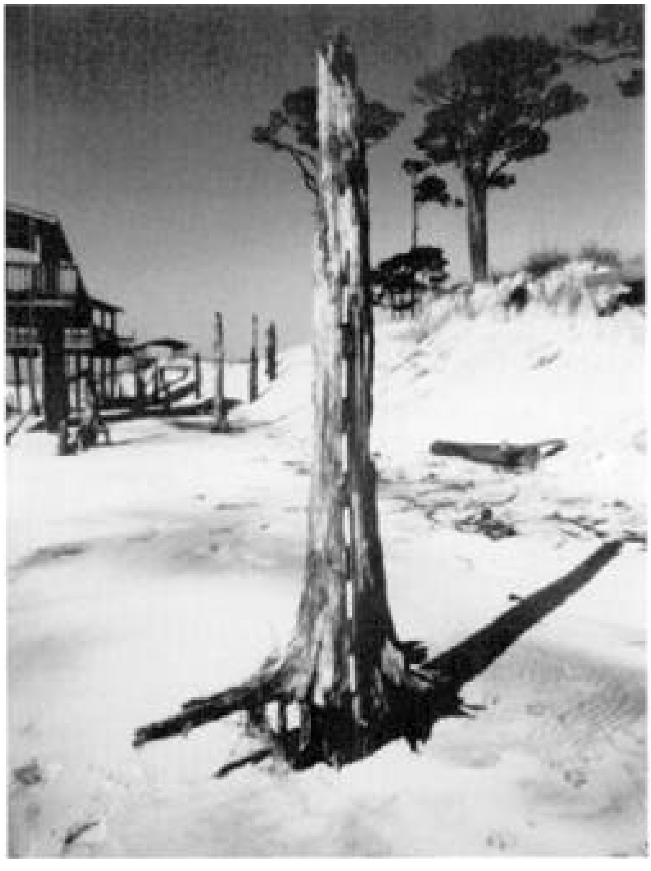

Figure 13. Dead pine tree in growth position. Note roots still extend outward from trunk. This tree was firmly in place and could not be moved. If the island remained relatively stable for thousands of years then this tree and the surrounding paleo-maritime forest should not exist. Biological activity coupled with migrating sands should have broken down this woody material many hundreds of years ago. Instead this reflects what the author believes is a dynamic barrier island, still seeking its equilibrium with sea forces and better explained using the young earth Flood model. Scale is in 6 inch units.

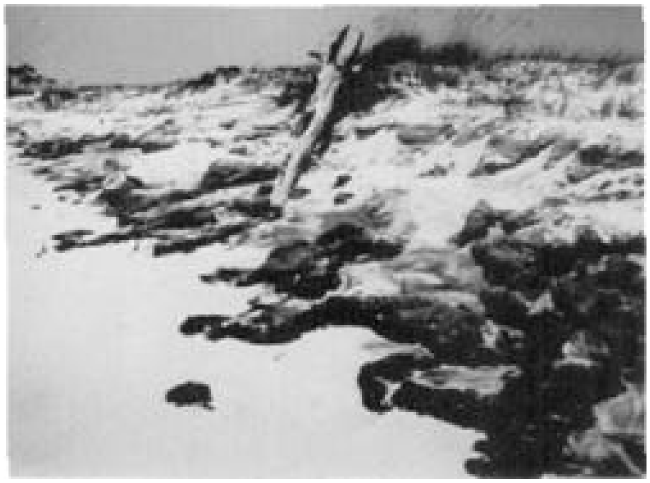

Figure 14. Maritime forest paleosol. This darkened outcrop exposes the former soil in which the maritime forest once grew. This paleosol is semi-lithified due to the organic matter and iron cement generated by the plant life which once grew in it. Extensive root traces also confirm the fact that this was a paleosol.

too distant past, wind blown sand dunes migrated rapidly over the then-existing maritime forest, burying all vegetation in its path (predicted to occur on barrier islands by Leatherman, 1982, pp. 47-54). Although I have no means of dating the woody tree material, I believe that this wood is no more than 200 years old. This implies that a paleo-maritime forest existed where the shoreface is today as recently as 200 years ago. Additionally, the paleosol and organic soils in which the forest grew are also exposed (Figure 14). Once again if the island was stable for the thousands of years proposed (i.e., 18,000), then all of this paleosol and organic material should have "weathered" away due to the high permeability of the overlying beach sands. This organic material exists within the sand in an oxygenated vadose zone. This zone undergoes intense weathering due to both anaerobic and aerobic bacteria which break down the organic materials resulting in the destruction of the organic material. However, if sea-level conditions have-changed rapidly (sea-level rise and coastal subsidence following the Ice Age event predicted by the young earth Creation/Flood model) resulting in the rapid destruction of a barrier island, then this paleosol and organic matter would be expected to be present. The exposed septic tank and landfill reinforce the rapid loss of beach face experienced by Dauphin Island. These features were exposed without additional storm energy generated by hurricanes and show that "storms" (i.e., hurricanes) are not necessary in the rapid erosion of the island.

Man continues to struggle with natural forces in preserving the barrier islands which exist today. Barrier islands are continuing to teach geologists and geomorphologists about the processes that form and shape them. I believe that the rapid changes that barrier islands undergo are better supported by the catastrophist's (young earth Creation/Flood) model, rather than the uniformitarian model. The author will continue to do field work on Dauphin Island to determine the accuracy of the predictions made by the young earth Flood model and hopes to report on those findings in upcoming articles.

Acknowledgments

The author thanks Dr. E. L. Williams, Dr. J. K. Reed, and other individuals for their initial review of this article. I also wish to thank E. F. Thompson and G. W. Isphording for providing reference material, and G. W. Isphording for valuable field assistance. Additionally, I express my gratitude to my wife Susan for giving me the time to study the island and write this article. Glory to God in the highest (Pr 3:5-6).

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Carl R. Froede, Jr.*

The Housetop Mountain Boulder Bed Member Described—Part II on The Haymond Formation, Marathon Basin, Texas

In the Marathon Basin of the Trans-Pecos area of Texas, there are exposed outcrops of mudstone beds which contain exotic boulders and gigantic sedimentary rocks. One of the sedimentary boulders is over 40 meters (m) in length. The boulders appear to have been transported for significant distances before being deposited.

These strata were named the "boulder bed members of the Haymond Formation." We have carried out field

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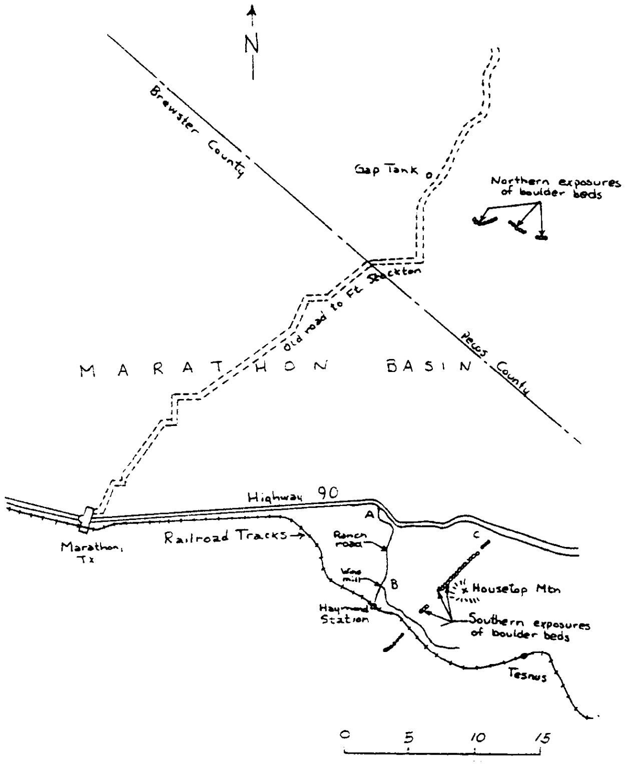

Figure 1. Map showing southern and northern exposures of the boulder beds in the Haymond Formation. Map redrawn from Hall (1957, p. 1634) by Brenda L. Lindley-Anderson.

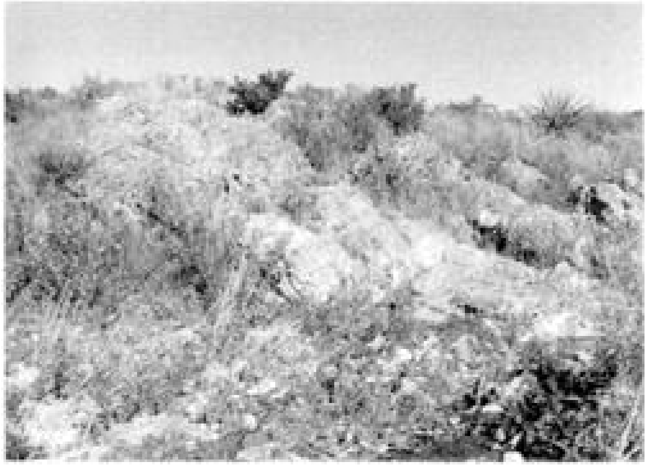

Figure 2. Bouldery terrain approximately 1.5 km southeast of the windmill and water tank ("B" of Figure 1). Perhaps these are boulders in the mudstone matrix. Photograph by E. L. Williams.

observations of the southern exposure of the boulder beds and have reviewed the literature extensively. We believe the origin of these wildflysch beds can best be described by a catastrophe involving several components and we intend to deal with origins theories in our next report. We hope these essays will serve to generate an ongoing series of creationist papers on the nature and origin of this boulder bed and many other boulder beds worldwide.

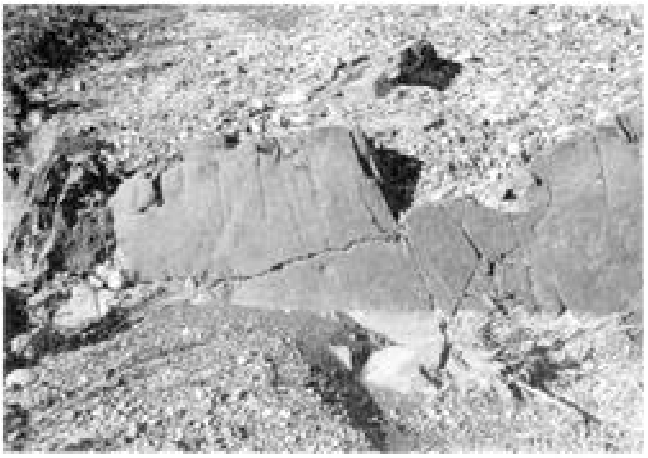

Figure 3. Large boulder exposed in a small wash, about 1.5 km southeast of the windmill and water tank ("B" of Figure 1). Photograph by E. L. Williams.

Boulder Bed Locations

The boulder bed member of the Haymond Formation is exposed at the eastern and northern margins of the Marathon Basin. The Marathon Basin is a foreland basin deposited along the Ouachita-Marathon orogenic belt. The Marathon Basin was known in earlier literature as a "geosyncline."*

The southern exposure of the boulder beds starts about 4 kilometers (km) southeast of Haymond station, a location along the Southern Pacific Railroad tracks. It extends in a straight line northeasterly, passing about 0.8 km west of the Housetop Mountains. Alluvium covers the Haymond exposure at certain locations and the boulder beds disappear from view about 0.8 km south of Highway 90, 24 km east of the town of Marathon, Texas (see Figure 1).

The southern exposure forms a belt that is approximately 13 km long, extending northeastward parallel with the local steep folding (Hall, 1957, p. 1633). Sellards (1931, p. 9) commented that the boulder bed manifests ". . . particularly good exposures west of Housetop Mountain." For maps of both the southern outcrop and a more northern exposure, see our Figure 1 and also consult Sellards (1931, p. 10), Hall (1957, pp. 1634-1636), McBride (1966, p. 6), Flores (1974, p. 710), and Flores (1975, p. 2289).

The northern exposure of what are thought to be the same boulder beds lies in adjoining Pecos County, TX, southeast of a location called Gap Tank. The northern outcrop is referred to by many other names including the "Old Clark Place." It is about 24 km directly north of Highway 90.

Field Observations

In 1991 our worker attempted to reach the Housetop Mountain region of the southern exposure. He located an ungated and unpaved road branching off from Highway 90 (A of Figure 1), very near the widely photographed roadcut showing the vertically folded

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*Frazier and Schwimmer (1987, pp. 340-344) develop a modern interpretation of The Ouachita-Marathon basin sedimentary history.

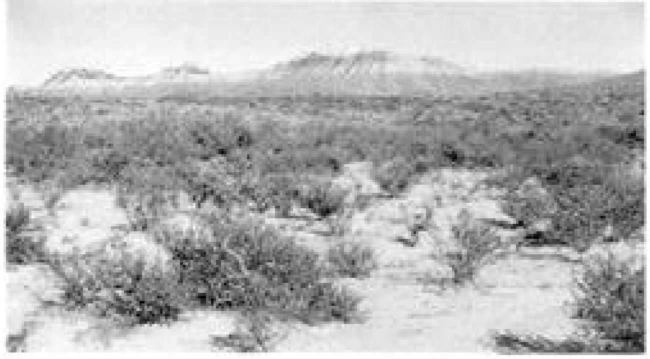

Figure 4. A view of Housetop Mountains looking northeastward from area "B" of Figure 1. The southern exposures of the boulder beds are in the foreground, not visible at this distance and vantage. Photograph by E. L. Williams.

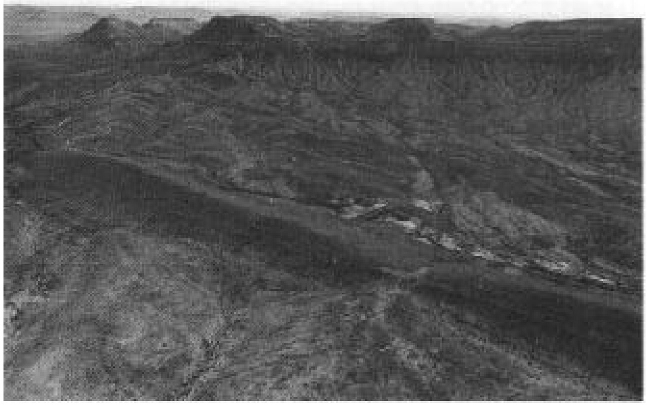

Figure 5. Aerial photograph showing the Housetop Mountains in the upper center. This view is looking to the northeast. Some of the southern boulder bed exposures are between the ridgeline (foreground) and the mountains in the background. The unconformity between the flat overlying Cretaceous strata and the folded Haymond strata (below) can be seen on the mountains in the distance. Photograph by R. L. Goette.

Haymond flysch beds. This road led southward to old Haymond Station. Near this road he located a windmill and a water tank (B in Figure 1) which are close to the southern boulder bed outcrop. Directions have been published by Adams and Frenzel, 1952, pp. 29-35.

Southeastward from the water tank and windmill area he photographed possible examples of the boulders (Figures 2 and 3). He could not approach the boulder beds more closely because he was not granted access to the property but he photographed Housetop Mountain from that site (Figure 4). In 1994, two CRS scientists flew over the Housetop Mountain section of the southern exposure to obtain aerial photographs of this general region (see Figures 5 and 6). It is not possible to identify the boulder bed outcrop on these pictures or on additional aerial photographs from the United States Geological Survey.

We also photographed the northernmost section of the southern boulder outcrop from Highway 90 (Figures 7, 8, and 9). For the location of Figures 7-9, see C on Figure 1. Previously published photographs of the boulders are found in Sellards (1931, p. 14), Baker (1932, pp. 583, 584, and 589), Adams and Frenzel (1952, p. 37), and McBride (1969, p. 17; 1970, p. 79), and in many papers by King.

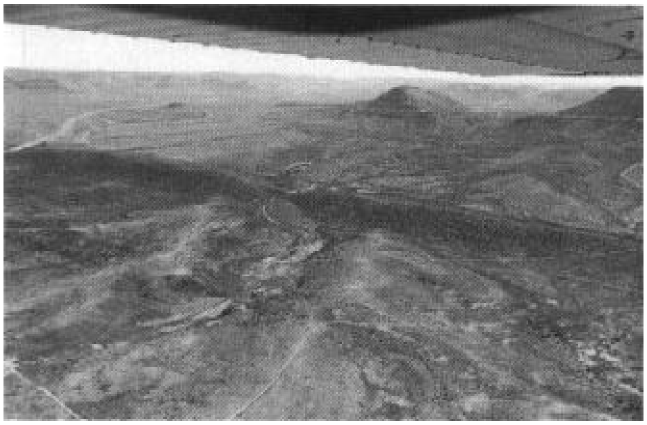

Figure 6. Aerial photograph showing a portion of Housetop Mountains in the upper left, a section of U. S. Highway 90 is visible. The aircraft wing is seen at the top. Photograph by R. L. Goette.

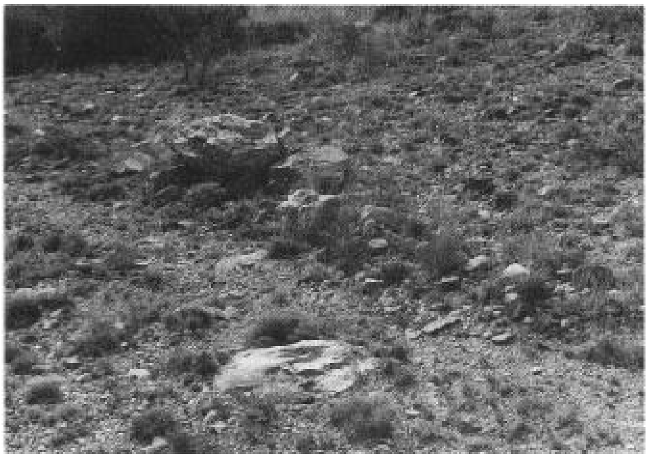

Figure 7. Boulders visible near a soil conservation sign. This picture was taken looking southward from the shoulder of U. S. Highway 90, about 25 km east of Marathon, TX, near area "C," Figure 1. These may possibly be the type of boulders characteristic of the Boulder Bed member. Photograph by R. L. Goette.

Stratigraphy of The Housetop Mountain Boulder Bed Member

The Marathon Basin contains deposits estimated at 3700 to 5000 m in thickness, as shown in Figure 10—see also McBride, (1973, p. 204), Baker (1932, p. 578), and McBride (1970, p. 67). The Gaptank is the uppermost formation in the Marathon Basin deposits and is classified as Upper Pennsylvanian (Flores and Ferm, 1970, p. 621; Ross, 1981, p. 136; McBride, 1973, p. 204; and McBride, 1966).

The Haymond Formation lies beneath the Gaptank and ranges from 1220 to 1310 m in thickness (Ross, 1981, p. 139; McBride, 1973, p. 204; McBride, 1966). The Haymond Formation has been judged to be Middle to Upper Pennsylvanian (Baker 1932, p. 577; Flores, 1969, p. 717; and Ross, 1981, p. 136). The contact between the Pennsylvanian and the Cretaceous, as seen on the slopes of the Housetop Mountains Figure 5), is an angular unconformity (Adams and Frenzel, 1952, p. 34).

The boulder bed member of the Haymond is contained in sandstone shale interbeds known as the Haymond Flysch. These flysch deposits were the subject of our previous publication (Howe and Williams, 1994).

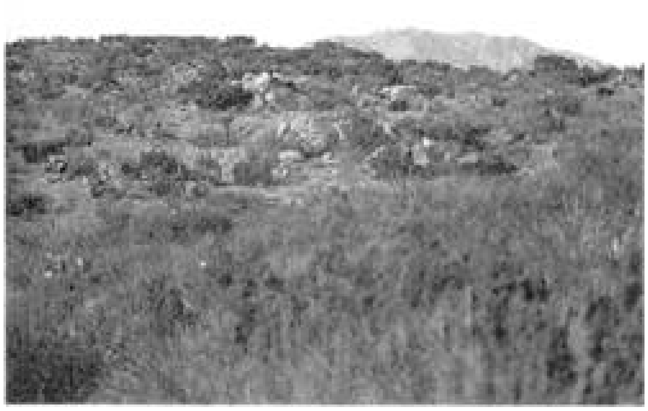

Figure 8. Boulders. This picture looks southeastward from U. S. 90, approximately 25 km east of Marathon, TX, near area "C," Figure 1. The boulders visible in the upper center resemble those photographed by earlier workers. Photograph by C. Froede, Jr.

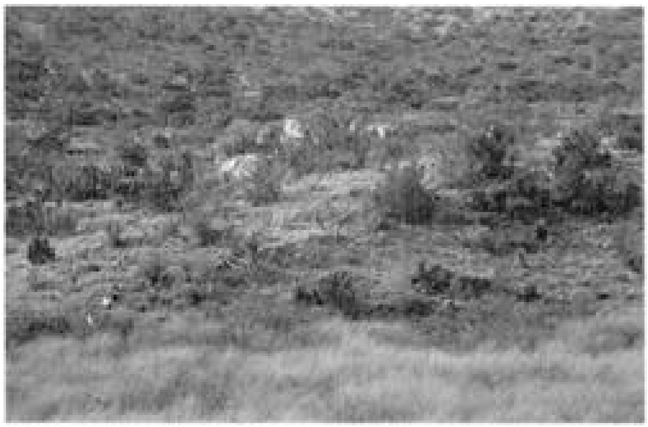

Figure 9. Boulders. This photograph was likewise taken in a southeasterly direction from area "C," Figure 1, approximately 25 km east of Marathon, TX from U.S. Highway 90. The boulders visible in the upper center may possibly be sedimentary fragments discussed in this paper. Photograph by C. Froede, Jr.

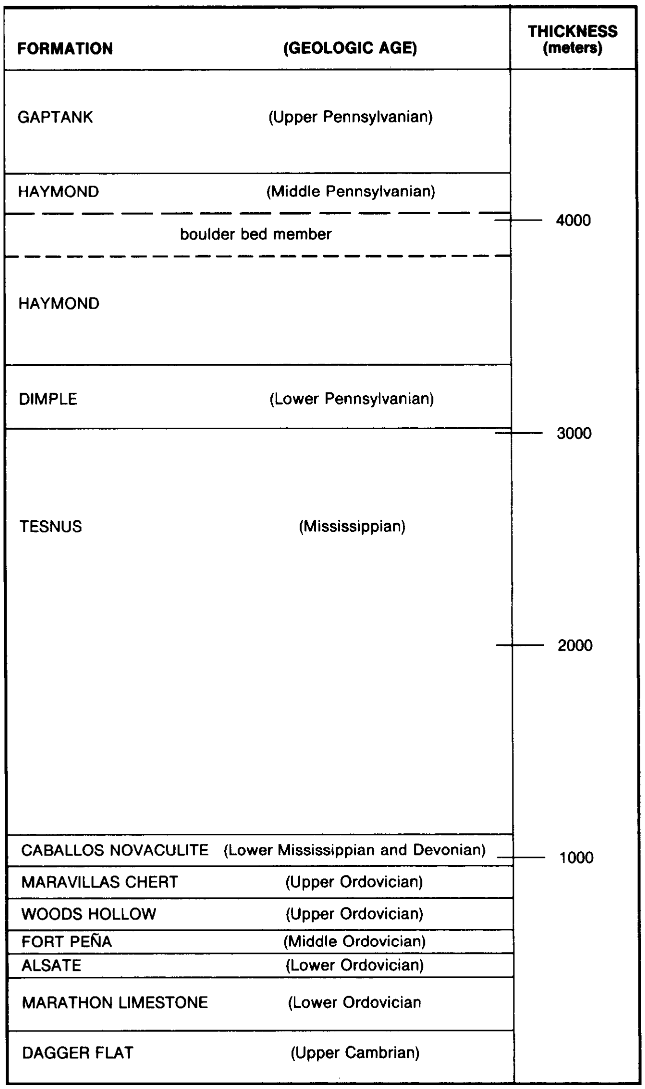

Figure 10. Stratigraphic column of rocks in the vicinity of Marathon, TX. This diagram is based on sections by McBride (1970, p. 68). Note that the Haymond Formation lies in the upper reaches of the Marathon Basin. The boulder beds, in turn, are in the upper part of The Haymond Formation.

Flores (1969, p. 717) noted that the flysch strata grade conformably into the boulder bed layers. The Haymond rests on the underlying Dimple Formation with a "sharp contact" (Flores, 1972, p. 3415).

The Haymond Formation is in the upper portion of the Marathon Basin deposits while the boulder beds are located in the upper half of the Haymond Formation (McBride, 1966, p. 10; Flores, 1969, p. 717). The boulder bed facies occur in a repeating sequence which is as much as 275 m thick (King, 1975, p. 10). For a typical stratigraphic section of the boulder bed sequence, see Figure 11. For other structural cross sections for the boulder bed member or of the entire Haymond Formation, consult King, (1937, p. 67), Hall, (1956, p. 2250) Hall (1957, p. 1636), McBride (1966, pp. 11-14), and McBride (1970, p. 70).

Since 1915, various geologists have studied these boulder bed outcrops. Brief histories of their discovery, description, and changing evaluation are found in such papers as Baker (1932, pp. 577-578), Sellards (1931, p. 9), Hall (1957, p. 1633), King (1958, p. 1731), Hall (1959, pp. 1633-1634), McBride (1966, p. 6), and Flores and Ferm (1970, pp. 623-624). These writers also describe an ongoing origins debate involving deposition on a delta, mudflow mechanisms, tectonics, or glaciation, a discussion we will review in a subsequent report.

Boulder Bed Strata

In the boulder bed outcrops, King (1937) listed three main types of strata: (1) massive arkose layers, (2) thin-bedded sandstone and shales, and (3) boulder-bearing mudstones. There is also a fourth facies here—conglomerates.

(1) Arkose Sandstones

The arkose layers of the boulder bed member ". . . rise to low knobs and hogbacks . . ." (King, 1937, p. 66). In King's various structural cross-sections up to five arkose layers are shown and they range up to 60 m in thickness (see "a" of Figure 11). The arkose beds lie beneath or between the different mudstone (boulder-bearing)

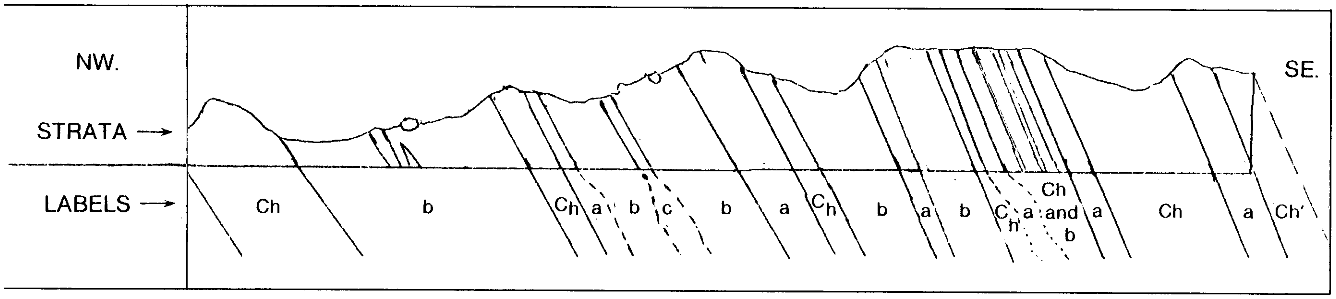

Figure 11. A diagrammatic cross section of the boulder bed member of The Haymond Formation at one location in its southern exposure; after King (1937, p. 67). Labels are as follows: Ch, thinbedded sandstone and shale (flysch); Ch', a more shaly phase; a, arkose beds; b, boulder-bearing mudstone; c, breccia. King's original section shows some of the larger "Pennsylvanian limestone," Caballos novaculite, and Dimple limestone in place. No attempt has been made to include those individual boulders here as King did in the original but they all occur in beds labeled b—boulder-bearing mudstones. Alluvium and gravel deposits present at certain localities on the original are not shown here. It is readily obvious in this figure that the boulder-bearing mudstones alternate with beds of arkose and with the sandstone-shale interbed strata.

strata (King, Baker, and Sellards, 1931, p. 200; and McBride, 1970, pp. 70, 76, and 78). At representative location in the southern exposure, Baker (1932, p. 581) described the arkose as an ". . . underlying thick bed of coarse olive-green arkosic sandstone . . ." followed by a layer of sandstone and shale interbeds. These arkose layers are spoken of as "massive" and as "coarse clastics," having few bedding planes (McBride 1970, p. 78; King 1957, p. 1732; McBride 1966, p. 10; and Baker, 1932, p. 582.)

(2) Sandstone-Shale Interbeds

King noted that the boulder beds are overlain and underlain by thin-bedded sandstone and shale (see "Ch" of Figure 11) (King, 1932, p. 148). These sandstone-shale interbeds are also found at the top of the Housetop Mountain boulder bed exposure where they show rhythmic bedding. McBride (1973, p. 204) referred to these interbeds as having undergone "disharmonic contortions which relate to . . . a soft-sediment stage of deformation . . ." Soft-sediment deformation would fit with rapid movement, after sediments had been deposited but before they had become lithified.

(3) Mudstone Beds

In the boulder bed outcrop Baker (1932, p. 582) counted six mudstone beds separated by sandstone and shale interbeds and arkose (see "b" of Figure 11). These mudstones layers contain the boulders, and are called the boulder-bearing mudstones (King, 1937, p. 66). The mudstone matrix is friable and unconsolidated (Baker, 1932, p. 598). The mudstone is massive, dark, and greenish-gray, ". . . containing fine flakes of mica, grains of rotten feldspar, and a few wood fragments . . ." King (1937, p. 68).

These mudstones are in the valleys or lowlands between the hogback ridges of arkose on the present-day terrain (King, 1937, p. 66). The mudstone occurs in lenticular beds. The beds themselves range from 8 to 46 m thick at the exposure near the Housetop Mountains (King, 1932, p. 148). Flores (1975, p. 2289) referred to these mudstones as "bouldery siltstones" containing slumped blocks. They have been called a "muddy matrix" which contain clasts lying around "helter-skelter" (King, 1975, p. 62).

(4) Conglomerates

As another facies or unit in the Haymond strata, Flores (1975, p. 2289) described conglomerates that ". . . are coarse to fine-grained upward, crudely imbricated, lenticular bodies intercalated in a gravelly to bouldery siltstone . . ." He indicated that these chert conglomerates were intercalated in the siltstone. At the northern exposure, Baker (1932, p. 592) described the conglomerates as grading into conglomeritic sandstone.

The Boulders Themselves

(1) Exotic Cobbles

The mudstone and conglomerate layers contain boulders which can be separated into two classes for descriptive purposes:

> (1) sedimentary rocks of older Paleozoic formations exposed within the Marathon Basin, and (2) sedimentary igneous, and metamorphic rocks of uncertain age and unlike older formations in the basin (exotic rocks). McBride (1970, p. 7).

The "igneous and metamorphic rocks of uncertain age," which McBride listed as number 2 above, will be considered first and will be called "exotic cobbles" or "exotic rocks." They are gravelly chunks which range in size from pebbles up to boulders, having diameters of a few millimeters up to one m. They are surrounded by mudstone (Flawn, 1958, p. 1734).

They include several varieties of sandstone, conglomerate, sheared porphyritic rhyolite, vein quartz, and schist (McBride, 1970, p. 78). King *et al.* (1931) reported the presence of aplite, pegmatite, and grandodiorite among the exotic rocks. Both Flawn (1958, p. 1735) and Sellards (1931, p. 3) reported finding sheared metaquartzite. Baker discovered that some were well rounded but others were "subangular" (Baker 1932, p. 5886). Sellards (1931, p. 13) referred to them as being totally unsorted.

These exotic cobbles are most prevalent in the southern exposure. Sellards (1931, p. 17) wrote that they are almost altogether lacking from the northern exposure.

Some of the cobbles are sedimentary graywacke sandstones like Tesnus but these are the only ones among the cobbles that resemble nearby sedimentary strata (King, 1957, p. 1733). Sellards (1931, p. 3) believed that their most likely origin was ". . . a region to the south or southeast, now covered by Cretaceous, except for one small exposure of schist on the Mexican side of the Rio Grande River." Baker (1932, p. 600) indicated that the source of the cobbles is unknown:

> . . . as a matter of fact there does not remain anywhere in the part of the area visible, a single vestige of any of the sources concerned in the above.

The age to which the cobbles are assigned has undergone significant change. Early in their study, they were given a Precambrian date (King, *et al.* 1931, p. 200). Presumably this Precambrian designation was based on the metamorphic (or igneous) character of the cobbles or some other undisclosed features.

The Precambrian characterization seems to have stood for about 26 years until Hall (1957, p. 1636) challenged it by judging the exotic cobbles to be part of Tertiary terrace gravels. Hall (1957, p. 1636) noted that there is ". . . no evidence to suggest Precambrian age." After Hall published this 1957 paper, King and other workers stopped referring to the cobbles as Precambrian but as rocks of "unknown" age.

Twelve years after Hall's paper, Dennison Kenny Burke, and Hetherington (1969) determined radioactive dates for these same igneous and metamorphic cobbles by using the rubidium-strontium and potassium-argon methods. The 12 whole-rock and mica ages ranged from 370 to 410 million years with the rubidium-strontium method. This would suggest the cobbles are not Tertiary terrace gravels as Hall assumed. Dennison and his coworkers interpreted these data as being late Silurian to middle Devonian. Concerning the location from which their granite gneiss cobbles were derived for dating, they stated that:

> The samples of Haymond boulders were collected by members of The Mobil Midland Division and by Dr. W. R. Muhlberger of The University of Texas (Dennison *et al.*, 1969, p. 246).

Dennison *et al.* dated samples from possible source localities to see if they could find deposits of similar rubidium-strontium age:

> Ten samples were dated from Texas and Mexico in an unsuccessful search for the specific source area for the boulders (Dennison *et al.*, 1969, p. 245).

The Largest of The Boulders

(2) Sedimentary Fragments

McBride (1970, p. 78) listed another group of boulders which included rocks that are larger than one meter and consist mostly of chunks of sedimentary rock derived from Paleozoic formations. These larger "erratic fragments" are not attached to their source beds but are apparently surrounded by the mudstone matrix.

King (1975, p. 10) tabulated the numbers of these larger boulders at one Housetop Mountain study area as follows: fossiliferous Pennsylvanian limestone, 55; Dimple Limestone, 3; Tesnus Formation, 11; Caballos Novaculite, 88; and Maravillas Chert, 1.

The largest of the fragments is a piece of Dimple Limestone described as being a 40 m slab of thin-bedded, compact, dark gray limestone (King 1937, p. 66). It is located about 5 km south of Haymond at a site which has been called "The Old Bennett Place." This huge piece of Dimple Limestone, other smaller Dimple fragments, and the other Pennsylvanian Limestone boulders terminate abruptly with broken ends; hence they are judged to have been transported and not to be limestone lenses deposited simultaneously within the mudstones (Sellards, 1931, p. 16).

The 40 m Dimple Limestone boulder differs from all nearby possible sources of Dimple Limestone. It more closely resembles an outcrop of Dimple Limestone that is 18 km away in the northwestern part of the Marathon Basin (King, 1958, p. 1733 and McBride 1970, p. 80). The fossil fauna in this limestone boulder most closely resembles the fauna of the Big Lake Oil Field, located in Reagan County, TX.

King (1937, p. 66), and Baker (1932, p. 587) correlated these fossils in the big boulder as Strawn or Lower Millsap of the Middle Pennsylvanian. This suggests that it is chronostratigraphically equivalent to Dimple Limestone but it differs from the Dimple source strata that are geographically the closest to it (King, 1958, p. 1733). Other limestone boulders ". . . contain fossils of early Pennsylvanian (Morrow) age" (Adams and Frenzel, 1952, p. 38).

Some of the more massive erratic fragments are angular equidimensional pieces of Caballos Novaculite which are classified as Devonian by King *et al.* (1931, p. 200). Fifteen of these Novaculite boulders exceed three m (King, 1975, p. 10).

Some of the pieces of novaculite are brecciated and show slickensides. This brecciation may have occurred before the boulders arrived at their present location (King, 1958, p. 1733).

King (1975, p. 10) found one block of Maravillas chert among the boulders and it differs from the nearest Maravillas deposits. It more closely resembles the Maravillas on the southeast flank of the Dagger-Flat anticlinorium, many kilometers away (King, 1937, p. 90; 1958, p. 1733).

There are other rock types among these large blocks including 11 cobbles of greenish Tesnus quartzite. Sellards (1931, p. 13) noted that some of the large pieces of Tesnus quartzite bear scratches. Scratches on the Tesnus boulders and slickensides on the Caballos Novaculite will be discussed in our next report.

Discussion

The existence of a geological phenomenon like the Housetop Mountain Boulder Beds, in which very large rocks have been deposited, supports a rapid and catastrophic emplacement. The boulders include rocks from several different geological "ages." The presence of metamorphic, plutonic, and gigantic sedimentary boulders in the same mudstone layers indicates that the beds were formed under unique circumstances. The fact that the source of the smaller boulders is not known, and that the larger boulders differ from potential source strata nearby, suggests that the catastrophe may have been widespread. It is obvious that the deposition of these wildflysch beds involved moving boulders up to 40 m. This demanded large quantities of energy. We believe this geological energy is a tribute (either "naturally" or "supernaturally") to the mighty power of the Creator:

The mountains melt like wax
before the Lord,
before the Lord of all the earth. Psalm 97:5*

Acknowledgements

We are grateful to the people who have contributed to the CRS Laboratory Fund. The interest from that fund has provided partial support for this project. Although we are fully responsible for all statements in this paper, we thank Mr. Carl R. Froede, Jr., PG., for reading an early version of this manuscript, for suggesting improvements, and for taking photographs. We also thank Dr. Robert Goette for his assistance in the field and with photography.

We thank two geologists and an anonymous *CRSQ* referee, all of whom supplied valuable suggestions. We appreciate the help of Ms. Beth Howe in some of the library work attendant to this paper. We thank Mrs. Phyllis Hughes for assistance in preparing the manuscript and Ms. Brenda L. Lindley-Anderson for drawing a map. We thank George Vose for flying us safely over the boulder bed exposures.

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ERRATA

CRSQ Vol. 31, March 1995, p. 216, Stone Mountain Granite has been referred to as a leucocratic *adamellite* or quartz monzonite.

CRSQ Vol. 31, March 1995, Figure 11, p. 218, Diabase dikes cut through sections of Stone Mountain Granite similar to this *Tourmaline* dike.

In *CRSQ* 32(1), p. 25, Dr. Steve W. Deckard's degree is an Ed.D., not a Ph.D.

CRSQ 32(2), September 1995, table of contents listing for *"Reprinted CRSQ Volume 21"* should have been p. 104, not p. 101.

***Death Valley Sand Dune Field, CA.* Fine grained quartz sand dunes have accumulated towards the northern end of Death Valley as a result of wind action. The sand dune field is sparsely covered with vegetation indicating a mobile mass of sand. The dune field has not moved far from the Death Valley playa and would suggest that it has not been subject to a steady directional driving wind for very long or it has been blown back and forth over the playa over the millions of years suggested by Uniformitarians. The sparse amount of sand does not appear to support the millions of years of erosion which is suggested to have elapsed since the evaporation of the former Pleistocene Lake Manly. Photo and caption by Carl R. Froede Jr.**

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UNIQUE WAYS OF GIVING: LAB DIRECTOR'S REPORT

JOHN R. MEYER, Director of the C.R.S. Van Andel Research Center

Gifts of cash are greatly appreciated and represent an immediate resource for our work. However there are many other ways of expressing your commitment through gifts. Some of the following strategies may represent a wise use of your resources. Please consider some of the following:

Matching Gifts: Many large companies provide a matching gift program in cooperation with their employees. Thus, for each dollar an employee donates to a qualified non-profit organization, the company may provide one or two dollars of matching funds up to some predetermined limit. The Creation Research Society has benefited significantly from such matching gift programs. You should contact company management to see if your employer provides this option.

Memorials: V. Luther Westberg was an active member of the Creation Research Society, and over the years we were privileged to publish several of his articles. His special interest was study of possible preflood atmospheres. As an engineer, Mr. Westberg established the Westberg Manufacturing Company, which specialized in automotive and aircraft instrumentation along with meteorological instruments. Since his death a few years ago, his family has carried on the business.

Because of their continuing commitment to creation science and to Biblical principles, and in order to honor the memory of their husband and father, the family has established a memorial in his honor at the Van Andel Research Center. This memorial will be called the V. Luther Westberg Memorial Weather Station. It will be composed of weather instrumentation produced by Westberg Manufacturing and will also feature a weather satellite data acquisition system. Also included are two portable anemometers for field research and three low temperature alarm systems for an anticipated green house.

The Westberg Memorial equipment will aid greatly in our educational and research programs. It will serve as a constant reminder at the Research Center to scientists and visitors alike of the dedication and commitment of the Westberg family.

Honors: Just as we want to establish memorials to departed loved ones, we also want to provide an avenue for honoring the living who have made significant contributions or have achieved significant goals in any area of their professional or personal lives. This public expression of honor may take the form of appropriately acknowledged donations of funds, equipment, books, or buildings. Please consult with us for details about possible projects.

Real Property: Gifts of land and buildings, especially those that have appreciated significantly since acquiring ownership, may provide the donor with considerable "tax leverage." Donations of valuable, but non-income producing real estate may be appropriate for some donors who are committed to the work of the Creation Research Society. Transfer of real property, since it often represents a major gift, should be carefully planned, both by the donor and by the Creation Research Society. Involvement of legal advice is essential. In the light of current liability concerns, the Society may require an environmental review of the real estate.

Personal Property: Donations may be of tangible items such as equipment, office furniture, and books, or they may be in the form of intangible personal property such as stocks, bonds or patents. As with all donations of significant size, professional tax and legal advice should be sought. Of special importance with gifts near the end of the year is insuring that a legal transfer has been effected in sufficient time for the donor to secure tax advantages for that year.

Life Insurance: Life insurance may afford a practical means of making a gift to the Creation Research Society. If you name the society as the irrevocable owner and beneficiary of the policy, the policy's value is a charitable contribution in the year of transfer. If the policy is not fully paid up, you will be entitled to a charitable contribution deduction for each subsequent premium payment.

Naming the Society as the primary or alternate beneficiary (but not as the owner) will not provide a current deduction for either the value of the policy or the premiums paid. However, your estate will be permitted to deduct the amount of proceeds payable to the Society for tax purposes. In addition, you will be able to provide a significant contribution at a relatively low annual cost.

A free pamphlet on Living Trusts is also available. As you consider support of the Creation Research Society and its stand for over thirty years for Biblical and scientific creation, we will be glad to be of assistance to you whenever appropriate. For help in these important matters, please fee free to write to me at the Van Andel Research Center, PO. Box 376, Chino Valley, AZ 86323, I can also be reached by phone at (520) 636-1153.

VIDEO REVIEW

Grand Canyon: Monument to The Flood, a video by Steven A. Austin. 1994. Institute for Creation Research. Santee, CA. 55 min. $19.95.

Reviewed by Carl R. Froede, Jr.*

This video provides an excellent companion to the Institute for Creation Research (ICR) book *Grand Canyon—Monument to Catastrophe* edited by Steven A. Austin (1994). The video features a number of geoscientists and geologists recognized as leaders in the field of catastrophic geology, and more specifically as creationists. These scientists coordinated in the writing of the referenced book about the Grand Canyon, and their knowledge of the canyon is based on first hand experience. The video begins with an excellent explanation regarding the interpretation of the rock record within the uniformitarian and catastrophist models.

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The video then proceeds with the technical, but well explained and highly enjoyable presentation of how the original strata formed, and the evidences to suggest the formation of the canyon following the Flood event, via a breached dam. The Grand Canyon's scenic segments, along with the accompanying computer graphics, easily convey to the viewer the magnitude and complexity that this canyon provides to the geoscientist. This video will serve as an excellent introduction to anyone not already familiar with the complex catastrophic geology of the Grand Canyon, and will serve as an excellent refresher to those who have already enjoyed a trip with ICR down the canyon. Anyone interested in the Grand Canyon, be they geologist or not, should have a copy of this most interesting and educational video. It promises to be as popular, if not more so, than the Mount St. Helens video released by ICR several years ago. Move over Mount St. Helens, this is the Grand Canyon!

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PRESIDENT'S REMARKS

Over the years that I have been associated with the Creation Research Society there has been slow but steady progress in the elucidation of the creation model of science. In the 1960's, most of the writings and speeches of creationists were aimed at revealing the weaknesses in the evolutionary hypothesis and the uniformitarian old earth postulates. This worthy effort continues. Recently I watched a television program where so-called scientific authorities misrepresented the evidence for the imagined molecules-to-man evolutionary process. Statements like "Transitional forms between mammals and birds exist in the fossil record" appear to be stated so as to deliberately mislead lay people. So the continual exposure of what is now the fraud of evolutionary certainty is needed.

However in the last 20-25 years, creation scientists also have been developing viable creation models of origins from the perspectives of biology, chemistry, geology and physics. The progress is slow because most scientists who are creationists must work part-time on their theories since the majority of their time is consumed in other professional activity. Creationists cannot obtain research grants from the taxpayer's pockets as an evolutionist is able to do. Yet the scientific work of creationists continues. Also it is refreshing to read of work of "second and third generation creationists" who have entered the controversy and are now contributing to the effort. The number of scientists willing to identify themselves as creationists and actually write and speak on the subject has been increasing.

Some of the aforementioned progress has been reflected in the growth of the Society. The Quarterly is in its 32nd year of publication, a miracle in itself. More and more articles in the journal deal with research sponsored by the Society. These modest research efforts have been aided by the erection of our research center in Chino Valley, Arizona. Hopefully, in future years, even more laboratory and field research will be reported in the Quarterly.

Except for our research center director and various part-time secretarial help, all of our work is accomplished by volunteer labor. The editor and associate editor receive no compensation for their vital contributions to the production of the Quarterly. For over three decades volunteers have kept the Society moving! This is why we are limited to being a publication and research organization exclusively. Your willingness to write articles, to subscribe to the Quarterly, to contribute time and money has kept us going! I appreciate your part in the success of basically a completely volunteer Society that is dedicated to the creation viewpoint.

As many scientists contribute to the ever-enlarging creationist movement, I see a greater need to relate their findings and writings into a language and style that can be comprehended by laymen. Our Board of Directors continues to seek sensible avenues of this type of information flow. Copy and share articles and the future publication of a newsletter by Lane Lester are examples of this work. The associate editor, George Howe, envisions photo essays as a means to illustrate scientific concepts in laymen's language within the Quarterly. With our limited manpower, we try to do as much as we can to popularize scientific creationist subjects. The drive to "get the message to those who need it" is upmost in our minds.

The proliferation of local creationist groups and their activities, the increasing number of creationist journals, and the scheduling of creationist scientific conferences all have added a rich diversity to the healthy growth of the movement throughout the U.S.A. and the world. Possibly as we continue to grow, there will be the founding of specialty creationist journals, i.e., possibly one for biology, another for geology, etc. Also conferences organized along the lines of a specific scientific discipline may be in store for the future. I hope that the Creation Research Society can share the development of creationism in years to come.

May I thank those who pioneered the modern creationist movement and those who presently work for the cause. I look forward to future progress and successes. May the Creator bless our efforts!

Emmett L. Williams

BOOK REVIEW

The Golem: What Everyone Should Know About Science by Harry Collins and Trevor Pinch. 1993. Cambridge University Press. New York. 164 pages. $19.95.

Reviewed by Eugene Chaffin*

According to the medieval tradition described in the introduction to this book, the golem was a creature of clay driven by the Hebrew word for "truth" inscribed on its forehead. The authors use this name as the book title to help describe the sociological factors that mold the scientific community's concept of "truth." They choose seven case studies to illustrate their points. These cases will probably be interesting to the creationist in revealing various nuances of how science operates.

The cases involve published, "peer reviewed" reports of chemical transfers of memory between organisms, early experiments which led to the acceptance of the general and special theories of relativity, the cold fusion

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fiasco, Louis Pasteur's disproof of spontaneous generation of life, the events leading to the demise of Joseph Weber's "gravitational radiation," the raging controversy over the sex life of the whiptail lizard, and the ongoing story of the missing solar neutrinos. An enduring theme of the book is that science does not necessarily make decisions based on clear-cut experimental results, but often it involves other factors such as the reputations of the scientists and the institutions where they happen to work. Often details of the materials and methods used in experiments become important only because of the argumentation used by one side or the other, not because of the scientific merit involved. Readers of the *Creation Research Society Quarterly* are familiar with the biases involved in the evolution-creation controversy. This book brings to our attention stories of bias and injustice previously known only to the scientists involved or to a few historians of science. It will definitely help to highlight how science reaches a consensus.

PHOTO ESSAY

The Omnivorous Red Fox

A remarkable series of photos (see the cover of this issue) was taken in east-central Illinois, about 150 miles south of Chicago and 13 miles west of the Indiana border, in an area of open fields with no trees or brush. The photographer, Jerry Whitesell, originally seeing only the Red Fox *(Vulpes fulva),* began to approach the animal to get a better photo. However, the fox paid little or no attention to the human. The object of the fox's attention was a snake heading for a patch of longer grass. Before the snake reached the long grass, the fox lunged for the snake, grabbed it, and killed it. Suddenly the fox became aware of the photographer and ran away with the snake in its mouth.

From these photographs amateur herpetologist and CRS member Tom Tilton identified the snake as, ironically, a western fox snake *(Elaphe vulpina vulpina).* According to Minton (1972, p. 275):

> The fox snake is principally a grassland species . . . although it also occurs in sandy scrub oak. [It] persists longer than most large snakes in highly agricultural areas . . . [and] finds refuge in pastures, along railroad rights-of-way, and about old buildings.
>
> [It] occurs from northwestern Indiana and the northern peninsula of Michigan southwest to southeastern South Dakota and eastern Missouri.

The Red Fox provides a number of interesting challenges to the student of origins. These include its distribution, its uncertain taxonomy and the origin and design of its physiology as an omnivore (ability to eat both plants and animals).

Walker (1975) reviews the world-wide biology of the Red Fox and its allies. The Red Fox is widely distributed in North America, extending from the northern Alaskan slope into the Big Bend country of Southern Texas. It is currently absent in the grasslands east of the front range of the Rocky Mountains, in most of the deserts of the Southwest, along the western coasts of the U.S. and Canada, and in the extreme southeastern U.S. It is apparently widely distributed in Europe, in Asia, and in much of Africa except the Sahara desert.

In some geographic areas, however, its absence is puzzling. In Arizona, for example, it is found only in the extreme northeastern corner (Hoffmeister, 1986, 1971). It is oddly absent from within and around the Grand Canyon where much apparently suitable habitat exists. It is also absent in the desert grassland and pinyon-juniper community near the Creation Research Society's Van Andel Research Center. Whether the Red Fox is such a recent arrival that all potential habitats have not yet been filled or whether these habitats in northern Arizona were formerly occupied, is not known.

Burt and Grossenheider (1964) report that one Red Fox is known to have traveled 126 miles from the den where it was born. Current distribution patterns and great mobility are consistent with a recent, Near-Eastern spreading center as expected from the creationist model of origins.

The uncertain taxonomy of the Red Fox should come as no surprise to the creationist biologist who recognizes the Genesis "kind" as the primary taxonomic unit. Although Burt and Grossenheider (1964) consider the New World Red Fox to be *Vulpes fulva,* they acknowledge that some authors categorize both the Old World and New World Red Fox as *Vulpes vulpes.* In his extensive *Mammals of Arizona,* Hoffmeister (1986) considers the North American Red Fox to be *Vulpes vulpes.* In addition, Hoffmeister notes that Van Gelder (1978) even questions the taxonomy at the genus level. Hoffmeister recognizes three genera within the family of the Canids: *Canis* (wolves, coyotes, dogs), *Vulpes* (Red Fox and Kit Fox), and *Urocyon* (Gray Fox). Van Gelder (1978) combines all three into the genus, Canis. Thus, the taxonomy of the Red Fox is apparently uncertain at both the genus and species levels.

It is interesting to speculate on the possibility that the original "kind" is equivalent to the "genus" of the modern taxonomist. Perhaps dogs, coyotes, wolves, dingos, and jackals, along with the wide assortment of foxes found in many parts of the world, constitute one original, created type with a great deal of built-in genetic diversity.

Could the broader interpretation of the genus "*Canis*" and one of the Genesis "kinds" be equivalent? Do the Canids represent an example of the Genesis "kinds" in the modern world?

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NINE NEW SPECIES AND A NEW GENUS OF DOMINICAN AMBER ANTS OF THE TRIBE (CEPHALOTINI HYMENOPTERA: FORMICIDAE)

GIJSBERTUS VIERBERGEN AND JOACHIM SCHEVEN*

Received 15 November 1994; Revised 27 March 1995

Abstract

Fossils of Cephalotine ants are frequently encountered in Dominican amber. Of 22 specimens examined 18 belong to species not known from the Cephalotine fauna of today. Four specimens could not be identified to the species level. Five species of the genus ***Zacryptocerus*** *are described as* ***Z. alveolatus*** *n.sp.,* ***Z. integerrimus*** *n.sp.,* ***Z. obscurus*** *n.sp,* ***Z. pseudo-aztecus*** *n.sp. and* ***Z. squamosus*** *n.sp., together with four species of the newly raised genus* ***Exocryptocerus (E. elevatus*** *n.sp.,* ***E. serratus*** *n.sp.,* ***E. truncatus*** *n.sp. and* ***E. jansei*** *n.sp.).*

The Cephalotine fauna of the Caribbean of today is poor in regard to the past and consists of only four well defined species. This low number indicates a depauperation of the ant fauna and possibly the whole insect fauna in the Caribbean. Most likely this depauperation was caused by a geological and climatical change before or shortly after the Flood.

Introduction

In view of the number of available Dominican amber ants for study, our knowledge of these ants is restricted. C. Baroni Urbani and E.O. Wilson have studied these ants most intensively, with the aim to retrace the supposed evolution of this group of social insects. Wilson, 1985b, however, concluded that these ants did not live "in the most crucial time frame in which to study fossils in order to understand the key events of ant evolution." Only 8% of the genera and "well-defined" subgenera in the Dominican amber were unknown from the living world fauna. Because the entomological fauna of Dominican amber is so similar to our current ant fauna, evolutionists lose interest in them. For largely the same reason Baroni Urbani** (1992) discontinued the study of amber ants. Despite this, the similarity of the ants in amber with living ants is not overly pronounced. All species recorded appear to be new, but they are not definitely known to be absent from the ant fauna living today. If some of these species are living, then they are uncommon. The study of a number of representatives of a large genus from Dominican amber can result in new information about the similarities with the living species and their distribution. The genus *Zacryptocerus,* formerly known as *Paracryptocerus*, is suitable for this purpose, a genus occurring both in Dominican amber and with many present day forms. The genus belongs to the sharply distinct tribe Cephalotini.

The occurrence of the Cephalotini in Dominican amber with the genus *Paracryptocerus* is already known (Spahr, 1987). Urbani and Saunders (1983 published some drawings of undescribed species of this genus from Dominican amber. Up until now, however, no specimens from Dominican amber belonging to the Cephalotini have been identified to the species level.

The living Cephalotini were revised by Kempf based on morphological characters (Kempf, 1951; 1952; 1958). He divided the Cephalotini in four genera (Kempf, 1973) and approximately 105 species. Of these, the genus *Paracryptocerus* with 67 species is obviously the largest. In Kempf's classification *Paracryptocerus* is regarded as a junior synonym of *Zacryptocerus,* that originally consisted of only two species.

Zacryptocerus is almost exclusively Neotropical in distribution, as well as the entire tribe of Cephalotine ants. Only a few species of the tribe occur in the southernmost part of the Nearctic region (Arizona, Texas and Florida). All species seem to be arboreal and lignicolous. From an economic point of view the entire tribe is insignificant (Kempf, 1951). Their arboreal way of life caused the entrapment of these ants in the resin of trees. It is for this reason that inclusions of Cephalotine ants are not particularly rare in Dominican amber.

The Material Studied

In this study Cephalotine ants from the amber collection of the Museum of Comparative Zoology (Cambridge, Massachusetts) and the collection of the second author were studied. Respectively 12 and 10 amber specimens were examined for their taxonomical position. For comparison some present day Cephalotine ants were selected. Only those specimens were investigated, whose morphological description in the literature agrees well with the morphology of the amber ants.

Specimens of the following collections were studied:

JS = J. Scheven, Hohenlimburg, Hagen, Germany
MACN = Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina
MCZ = Museum of Comparative Zoology, Cambridge, Massachusetts
NMNH = National Museum of Natural History "Smithsonian Institution," Washington, D.C.
NMW = Naturhistorisches Museum Wien, Vienna, Austria

Descriptions of the Cephalotini in Dominican Amber

All identified ants in amber were workers, each enclosed in a separate amberstone. They appear to belong to nine species and two genera. Of these, five species could be placed within the largest genus of the Cephalotini: The genus *Zacryptocerus.* A new genus is raised to fit the remaining four species. The most striking difference between this genus and the known Cephalotine genera is found in the form of the hairs on the dorsum of the head and thorax (filiform respectively linear).

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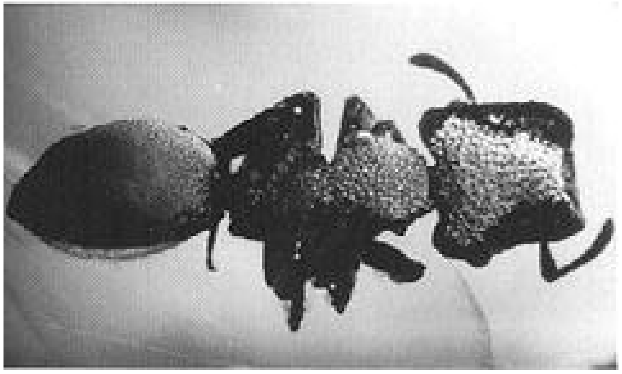
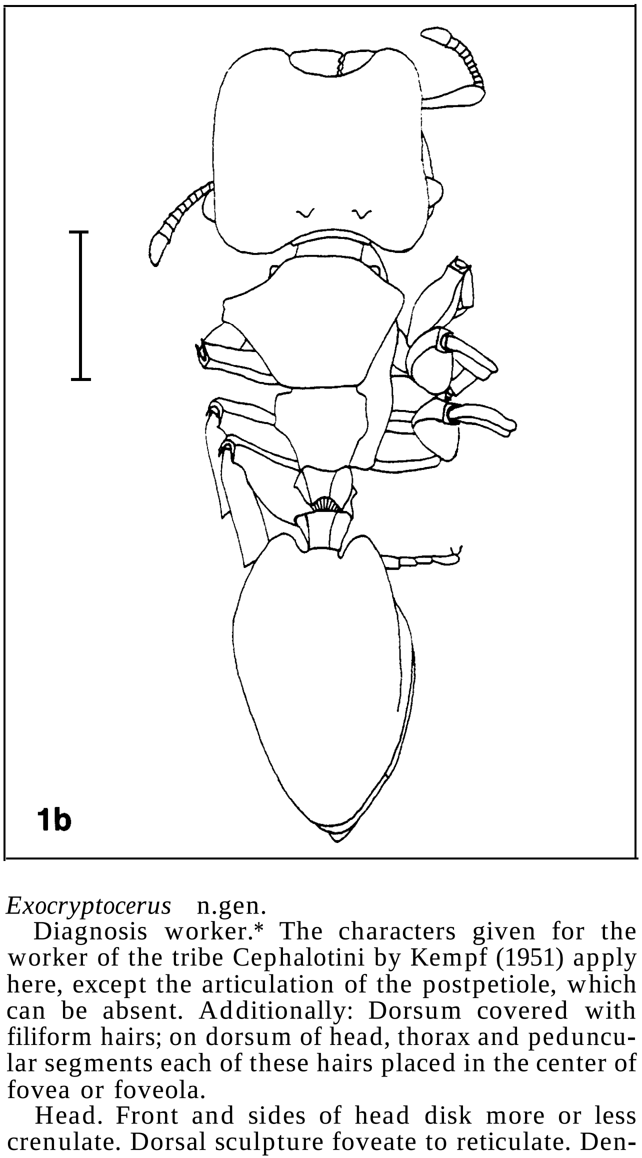
**In a recent note Dr. Baroni Urbani indicated that in the last few years one of his students has continued with the work on amber ants.



1a

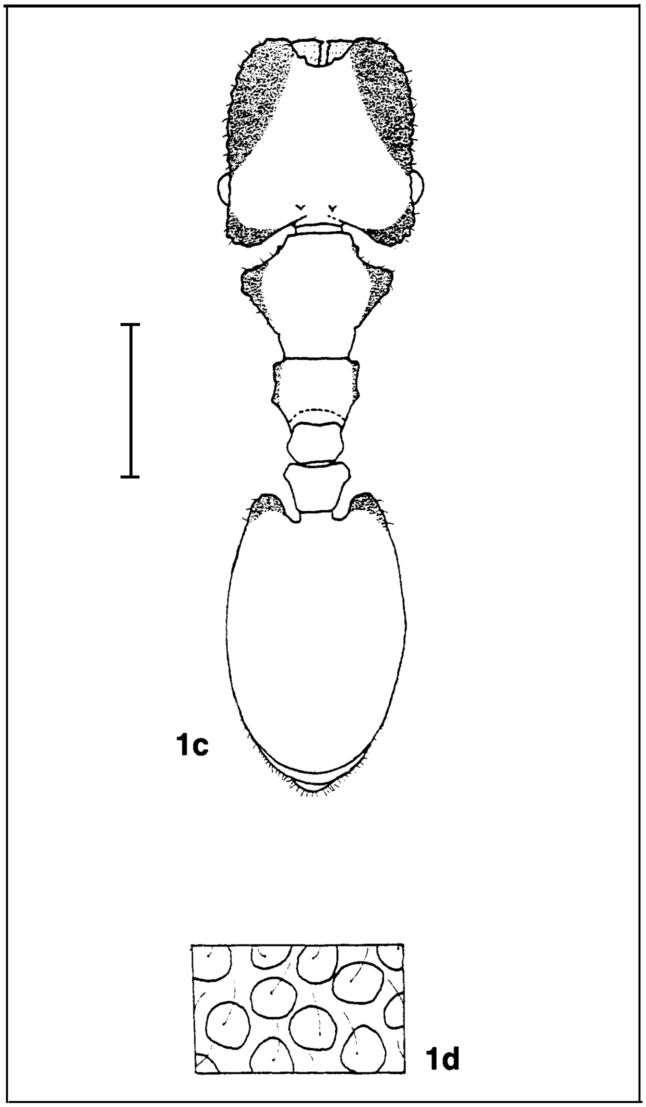


1b

Exocryptocerus n.gen.

Diagnosis worker.* The characters given for the worker of the tribe Cephalotini by Kempf (1951) apply here, except the articulation of the postpetiole, which can be absent. Additionally: Dorsum covered with filiform hairs; on dorsum of head, thorax and peduncular segments each of these hairs placed in the center of fovea or foveola.

Head. Front and sides of head disk more or less crenulate. Dorsal sculpture foveate to reticulate. Denticules on vertex present. Posterior border of occiput with lamina.



1c

1d

Figure 1. Worker of *Exocryptocerus serratus* n.sp.
1a. In Dominican amber (photo J. C. Vierbergen)
1b. Habitus (bar: 1 cm)
1c. Dorsum, without appendages (bar: 1 cm)
1d. Dorsal sculpture vertex (magnification approx. 120 x)

Thorax. Segments unarmed; laminae partly present or absent. Dorsal sculpture as on headdisc, but sometimes additional striae present (propodeum). Pronotum and mesonotum more or less fused dorsally; line of divorce commonly partly developed.

Peduncular segments. Unarmed; sometimes laminae of postpetiole present.

Gaster. Antero-marginal laminae poorly developed or absent.

Type species: *Exocryptocerus serratus* n.sp.

Exocryptocerus serratus n.sp. (Figures 1a-1d)

Diagnosis worker. Total length 5.2 mm. Dorsum covered with standing slightly bent hairs. Medium length hairs on head disc 0.08 mm. On head, thorax and peduncular segment each hair stands in the middle of a fovea.

Head. Length 1.4 mm; width 1.4 mm. Front and sides of head disc serrated. Dorsal sculpture reticulate-

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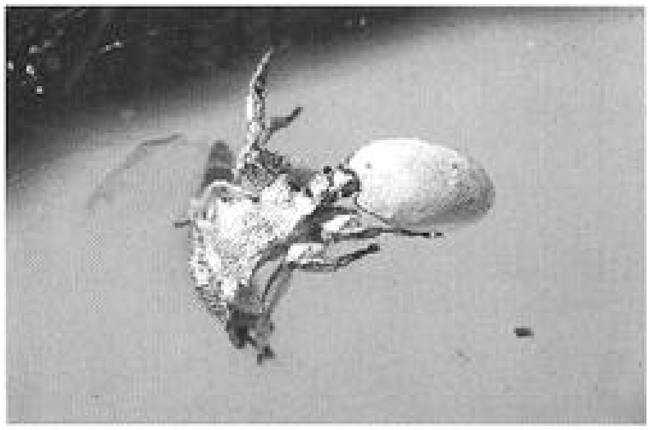
*There are several castes among ants. One of these castes is the worker caste which are numerous and easy to collect. Normally in insect species descriptions of males or females are sufficient for species diagnosis, but in ants, workers play the role.



2a

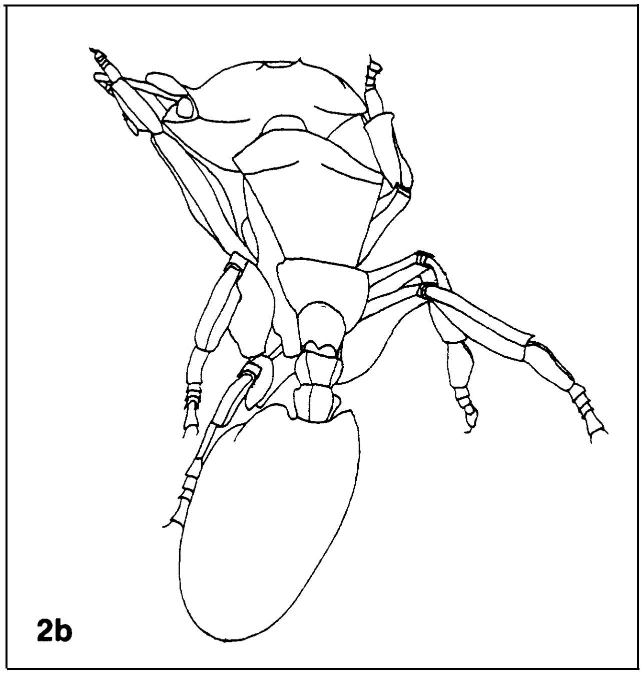


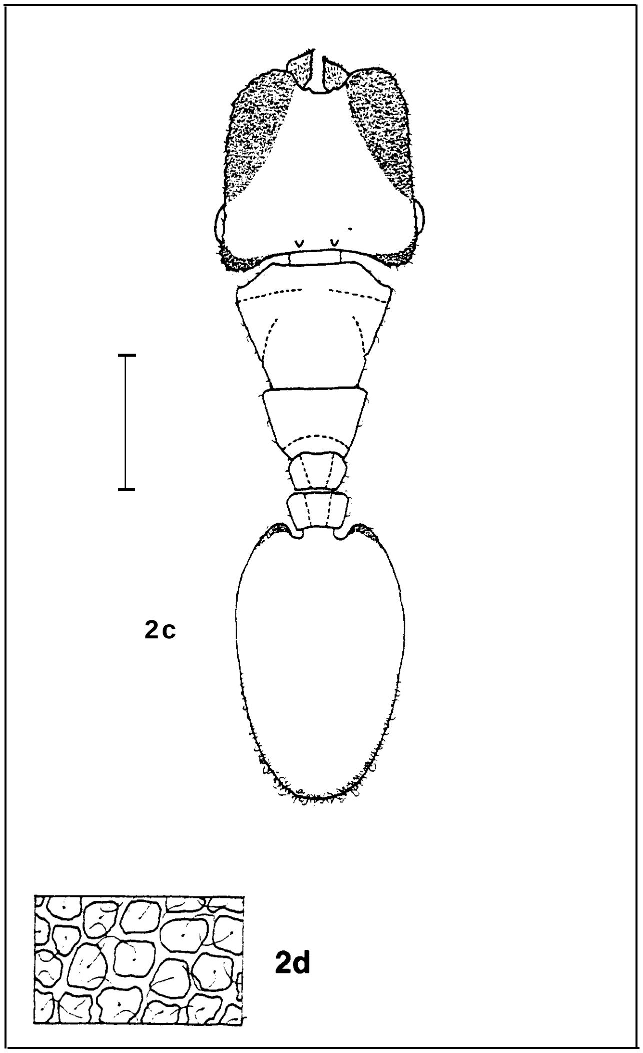
Figure 2. Worker of *Exocryptocerus elevatus* n.sp.
2a. In Dominican amber
2b. Habitus (bar: 1 cm)
2c. Dorsum, without appendages (bar: 1 cm)
2d. Dorsal sculpture vertex (magnification approx. 120 x)

foveate. Denticules on vertex present. Posterior border of occiput with broad lamina.

Thorax. Total length 1.4 mm. Pronotum and mesonotum completely fused. Length promesonotum 0.9 mm; width 1.2 mm. Dorsal sculpture as on headdisc, but especially on propodeum less regular. Striae absent. On each side of promesonotum a small tooth present anteriorly. Lamina on both sides of promesonotum broad and truncate. On sides of propodeum this lamina small and with very blunt teeth.

Peduncular segments. Petiole unarmed. Postpetiole with blunt teeth; width 0.4 mm. Both segments without laminae or carinae.

Gaster. Length 2.1 mm; width 1.2 mm. Antero-lateral borders with a small lamina. A few hairs present on the lamina and on all tergites, except tergite I.



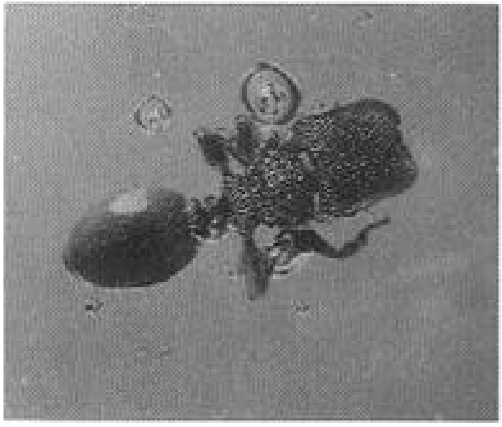
Remarks. This species is named after its strong serration around the borders of the head disk. The description above is derived from a worker which is deposited in the collection of JS. Two additional workers studied are in the collection of the MCZ.

Exocryptocerus elevatus n.sp. (Figures 2a-2d)

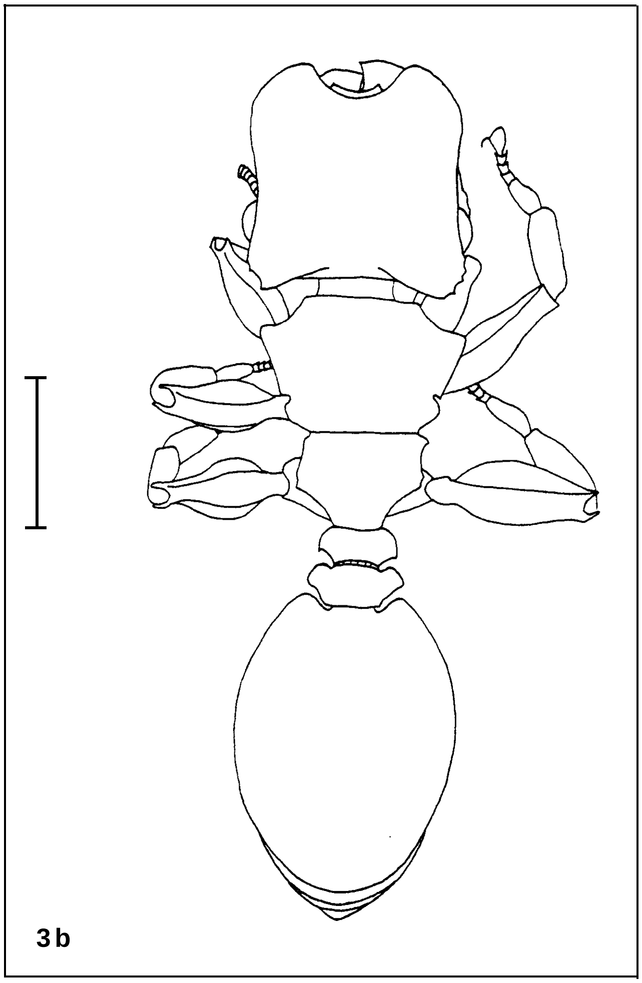
Diagnosis worker. Total length approximately 5.3 mm. Dorsum covered with descending hairs. In the middle of each foveola always one hair. Hairs numerous posteriorly on tergite I of gaster.

Head. Head disc flat dorsally. Dorsal sculpture reticulate-foveolate. Crenulate sides nearly straight. Posterior border of occiput with broad lamina. On vertex close to the middle a pair of denticules. Borders of headdisk elevated marginally.

Thorax. Total length 1.4 mm. At sides lacking laminae completely. Line of divorce between pronotum and mesonotum slightly visible at sides; medially pronotum and mesonotum completely fused. Length of promesonotum 1.0 mm, width 1.4 mm. Promesonotum in upper half with a broad transverse carina. Propodeum with reticulate-striate sculpture dorsally. Dorsal sculpture of promesonotum between head type and propodeum type.



3a



Peduncular segments. Petiole unarmed and without lamina. Postpetiole obtuse and without lamina; width 0.4 mm.

Gaster. Length 2.2 mm; width 1.4 mm. Antero-lateral borders with a small lamina.

Remarks. The name of *E. elevatus* is derived from the strong elevation of the margins of the headdisk. The only worker studied is deposited in the collection of JS.

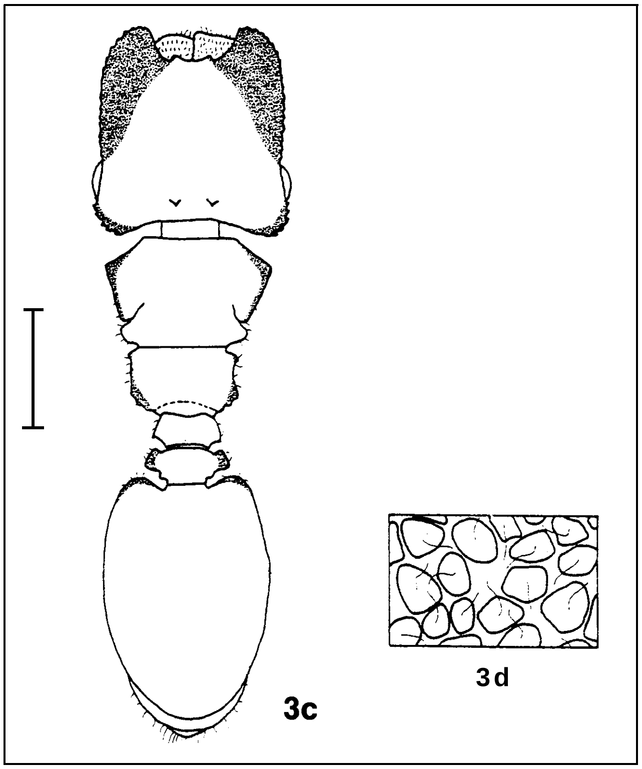


Figure 3. Worker of *Exocryptocerus truncatus* n.sp.
3a. In Dominican amber
3b. Habitus (bar: 1 cm)
3c. Dorsum, without appendages (bar: 1 cm)
3d. Dorsal sculpture vertex (magnification approx. 120 x)

Exocryptocerus truncatus n.sp. (Figures 3a-3d)

Diagnosis worker. Total length 5.5 mm. Dorsum covered with standing bent hairs. On head and promesonotum each hair originates from the center of a fovea.

Head. Length 1.6 mm; width 1.6 mm. Dorsal sculpture foveate. Frontal carinae and small postero-marginal laminae crenulate. On vertex a pair of denticules present. Postero-marginal laminae small.

Thorax. Length 1.5 mm; width 1.5 mm. Pronotum and mesonotum fused, but dorsally divided by a short suture on both sides; both sutures divide the posterior half of the promesonotum for about a fourth the width of this half. Dorsum of promesonotum reticulate. Promesonotal lamina small, hooked. Dorsum of propodeum reticulate-striate. Epinotal lamina small, interrupted and with a few blunt teeth.

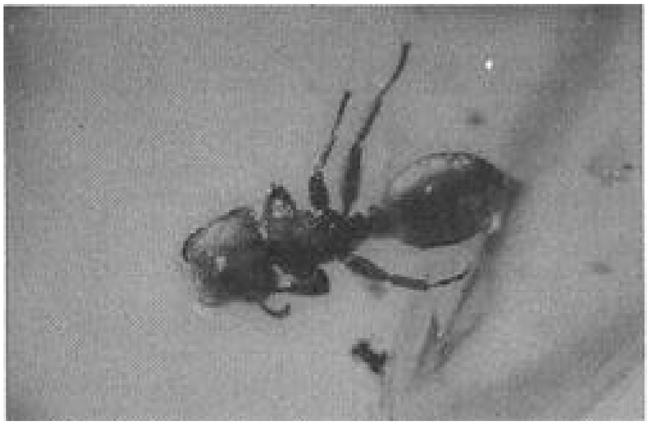
Peduncular segments. Dorsum reticulate, without carina. Petiole without lamina, but armed with small backwards pointing teeth. Postpetiole with a broad truncate lamina at both sides. Width postpetiole 0.67 mm; without laminae 0.49 mm.

Gaster. Length 2.1 mm; width 1.5 mm. Antero-marginal laminae small and with few hairs. A number of long hairs caudad.

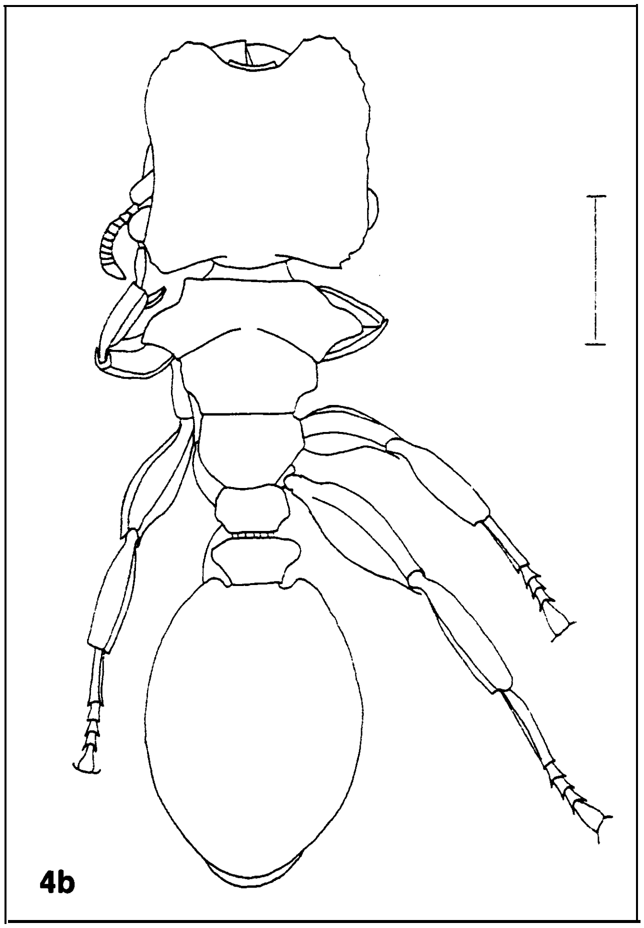
Remarks. The species is named after its typical truncate laminae of the postpetiole. The worker-type is deposited in the collection of JS.

Exocryptocerus jansei n.sp. (Figures 4a-4d)

Diagnosis worker. Total length 5.8 mm. Body and legs pubescent. On dorsum of head and thorax in the



4a



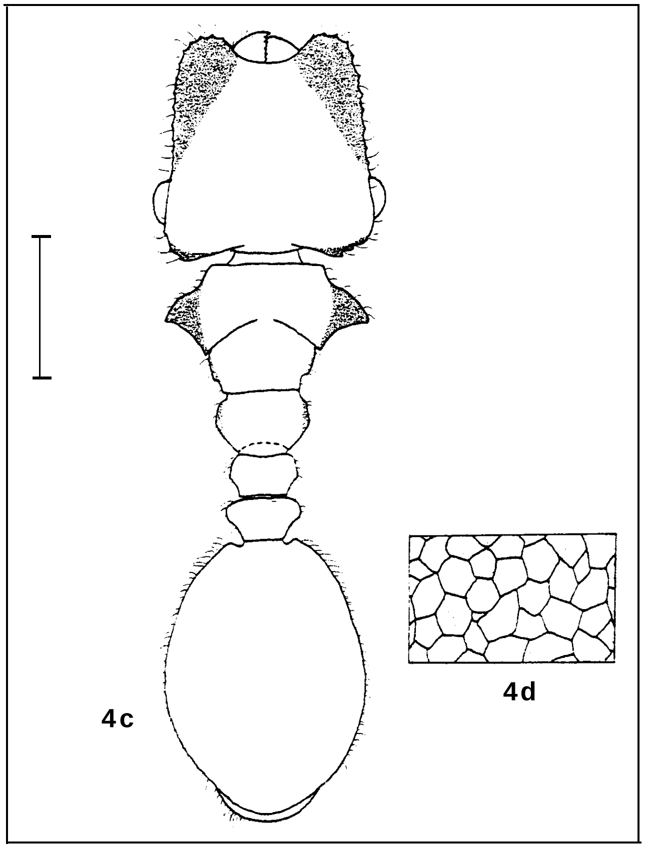


Figure 4. Worker of *Exocryptocerus jansei* n.sp.
4a. In Dominican amber
4b. Habitus (bar: 1 cm)
4c. Dorsum, without appendages (bar: 1 cm)
4d. Dorsal sculpture vertex (magnification approx. 120 x)

centre of each fovea a single slightly bent long filiform hair (hair length 0.09 - 0.13 mm). Head. Length 1.5 mm; width 1.5 mm. Dorsal sculpture deeply reticulate. Frontal carinae and very small postero-marginal laminae crenulate. Denticules on vertex present, but very small.

Thorax. Length 1.4 mm; width 1.5 mm. Dorsal sculpture reticulate (pronotum and mesonotum) and reticulate-striate (propodeum). Pronotum and mesonotum dorsally divided by an incomplete suture: in the middle this suture absent. Pronotum armed with teeth-like laminae (width of each lamina: 0.4 mm). Meso- and epinotal laminae small.

Peduncular segments. Dorsum reticulate and without carina. Laminae absent. Unarmed. Postpetiole slightly broader than petiole.

Gaster. Length 2.1 mm; width 1.6 mm. Antero-marginal laminae completely absent.

Remarks. This species is named in honour of Dr. J. Janse (Ede, The Netherlands). His remarks on the species concept were very valuable for this publication. The type-specimen is present in the collection of JS. A second worker of *E. jansei* is deposited in the MCZ.

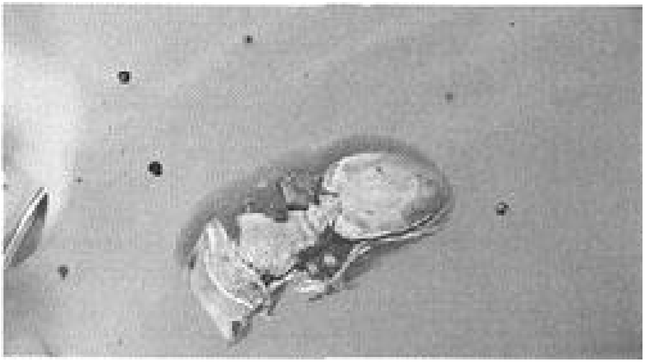
Zacryptocerus integerrimus n.sp. (Figures 5a-5d)

Diagnosis worker. Total length ~ 3.8 mm. Appressed linear hairs within foveola are present on all body segments. Caudad on the gaster erect linear hairs present.

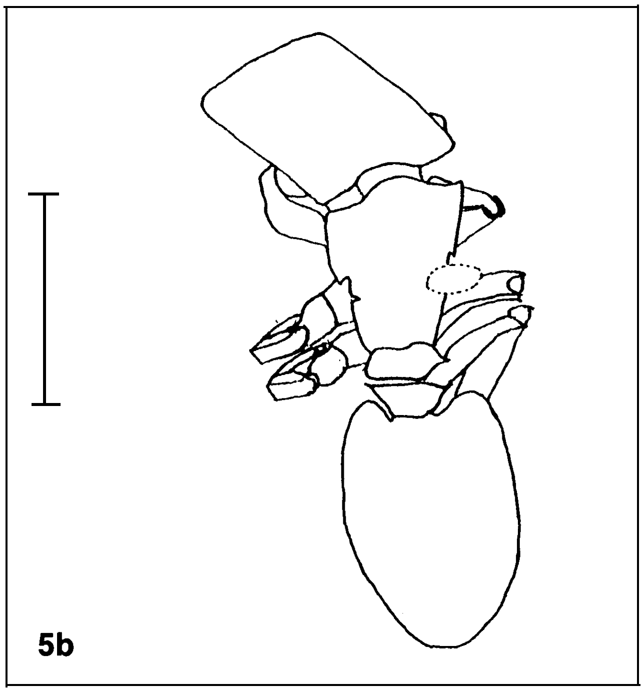
Head. Length 1.1 mm, width 1.0 mm. Dorsal sculpture foveolate. Sides almost straight; lateral and postero-lateral margins not crenulate. Denticules on vertex absent. Margin of occiput with small lamina.

Thorax. Total length 0.9 mm. Pronotum and mesonotum completely fused. Length promesonotum 0.6 mm; width 0.8 mm. Anterior border of promesonotum slightly arcuate. Striation absent on entire dorsum of thorax.

Peduncular segments. Unarmed petiole shortly pointed at both sides. Postpetiole laterally armed with short spines.



5a



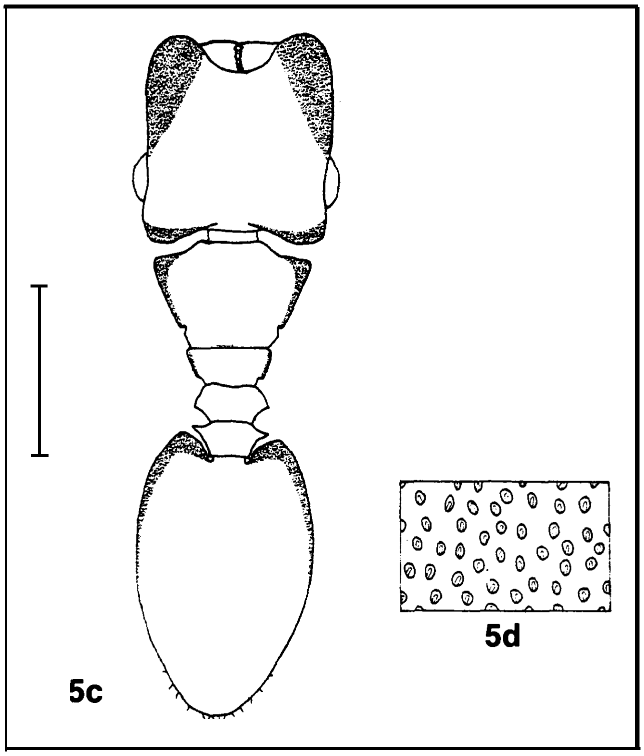


Figure 5. Worker of *Zacyptocerus integerrimus* n.sp.
5a. In Dominican amber
5b. Habitus (bar: 1 cm)
5c. Dorsum, without appendages (bar: 1 cm)
5d. Dorsal sculpture vertex (magnification approx. 120 x)

Gaster. Length 1.5 mm; width 1.0 mm. Anteriorly with a broad thin lamina.

Remarks. This species is named for the margins of the whole body, which are completely entire. The only known worker of *Z. integerrimus* is deposited in the collection of JS.

Zacryptocerus squamosus n.sp. (Figures 6a-6d)

Diagnosis worker. Total length 5.5 mm. All linear body hairs appressed and situated within fovea, except a number of linear hairs, which stand laterally on tergite 2, 3 and 4 of gaster.

Head. Length 1.5 mm, width 1.5 mm. Dorsal sculpture foveate. Sides slightly convex. Lateral margins not crenulate. Denticules on vertex absent. Margin of occiput with a thin lamina.

Thorax. Total length 1.4 mm. Length promesonotum 0.9 mm, width 1.3 mm. Promesonotal suture slightly developed. Sculpture on promesonotum with very weak striation; on propodeum foveolate-striate. Small thin lamina attached to the lateral borders of the promesonotum and propodeum.

Peduncular segments. The unarmed petiole seen from above bell-shaped. Postpetiole width 0.6 mm, laterally armed with a spine at each side.

Gaster. Length 2.2 mm; width 1.5 mm. Anteriorly with a broad foliaceous lamina.

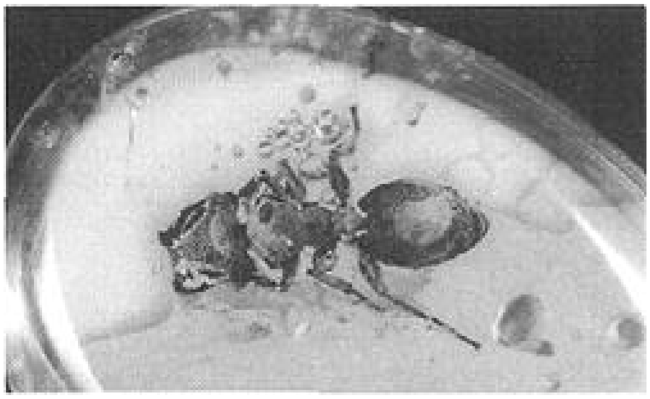
Remarks. Four specimens of *Z. squamosus* have been studied. Differences between the specimens are small; the length of the body is between 5.2 and 5.7 mm; the spine at each side of the postpetiole was most variable, it varied from blunt to acute. The species is named after the great number of linear scalelike-hairs on the dorsum of the body and legs. The worker-type is present in the collection of JS as well as two other workers of this species. Another worker is present in the collection of the MCZ.

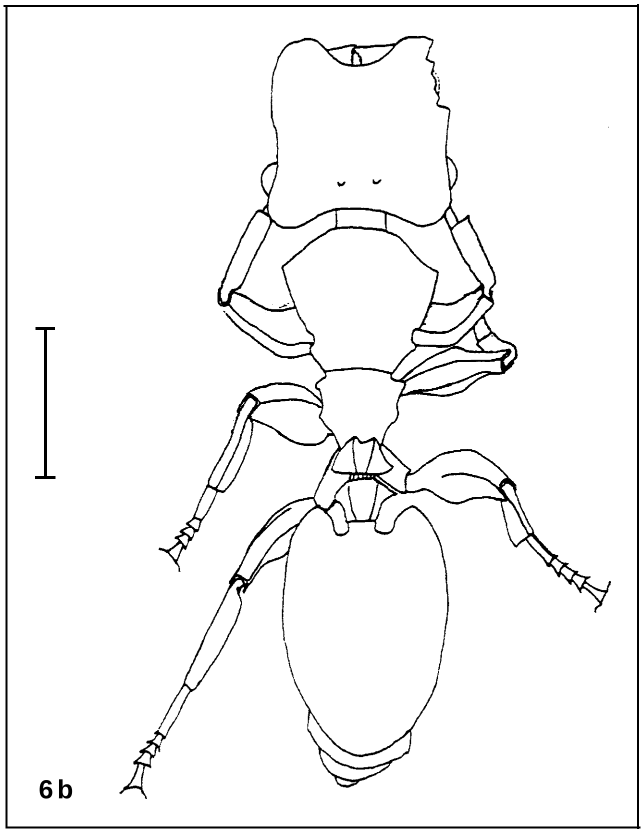
Zacryptocerus pseudo-aztecus n.sp. (Figures 7a-7d)

Diagnosis worker. Total length 4.0 mm. Only appressed linear hairs present on all body segments. Dorsally most of these hairs appear as canaliculate silvery scales within each foveola.

Head. Length 0.92 mm, width 1.23 mm. Sculpture of dorsal surface foveate to reticulate-foveate. Sides rather straight. Denticules on vertex absent. A few linear hairs project from the posterolateral very slightly crenulated corners.

Thorax. Line of divorce between pronotum and mesonotum completely absent. Promesonotum and propodeum with longitudinal striation; on promesonotum striation weaker than on propodeum. Lateral border of promesonotum and propodeum with a foliaceous lamina; the edge of this lamina rather straight.





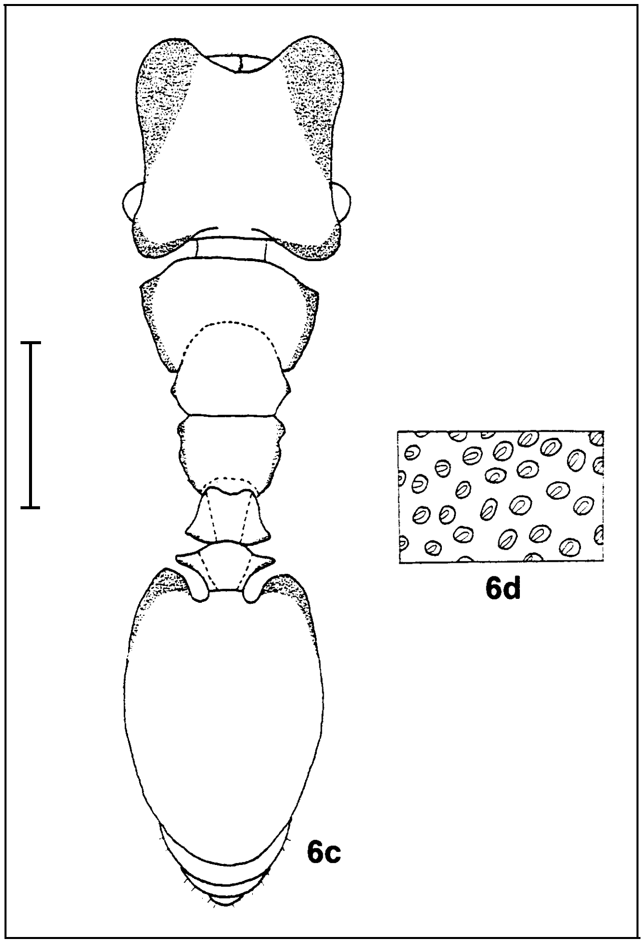


Figure 6. Worker of *Zacyptocerus squamosus* n.sp.
6a. In Dominican amber
6b. Habitus (bar: 1 cm)
6c. Dorsum, without appendages (bar: 1 cm)
6d. Dorsal sculpture vertex (magnification approx. 120 x)

Peduncular segments. Petiole and postpetiole with a small foliaceous lamina. Width postpetiole 0.53 mm.

Gaster. Width 1.33 mm. Anterolaterally with a broad foliaceous lamina.

Remarks. The species-name of *Z. pseudo-aztecus* is given for the similarity with Z. *aztecus* Emery, an extant species (for differences between these two species see below). Additionally, *Z. squamosus* n.sp. (described in this study) is morphologically comparable with *Z. pseudo-aztecus* and possibly identical. The main differences are the size of the body, the margins of the head and the presence or absence of a promesonotal suture on the promesonotum. *Z. pseudo-aztecus* can be regarded as a small form of *Z. squamosus*, but the absence in the living *Zacryptocerus* species of minor and major workers, other than soldiers, support the consideration of *Z. pseudo-aztecus* as a valid species. The soldiers found in the genus can be separated easily by the shape of the head disk. The worker-type of *Z. pseudo-aztecus* is deposited in the amber-collection of JS. Worker-paratype: collection of the MCZ.

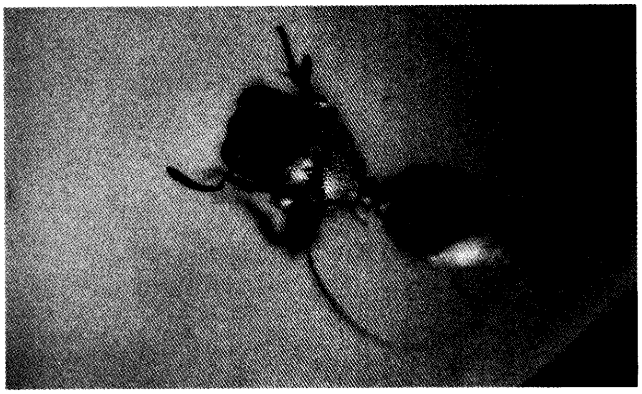
Zacryptocerus obscurus n.sp. (Figure 8)

Diagnosis worker. Total length ~ 4.5 mm. Most body hairs appressed and linear. A few hairs are standing distally on leg segments and posteriorly on the segments of the gaster.

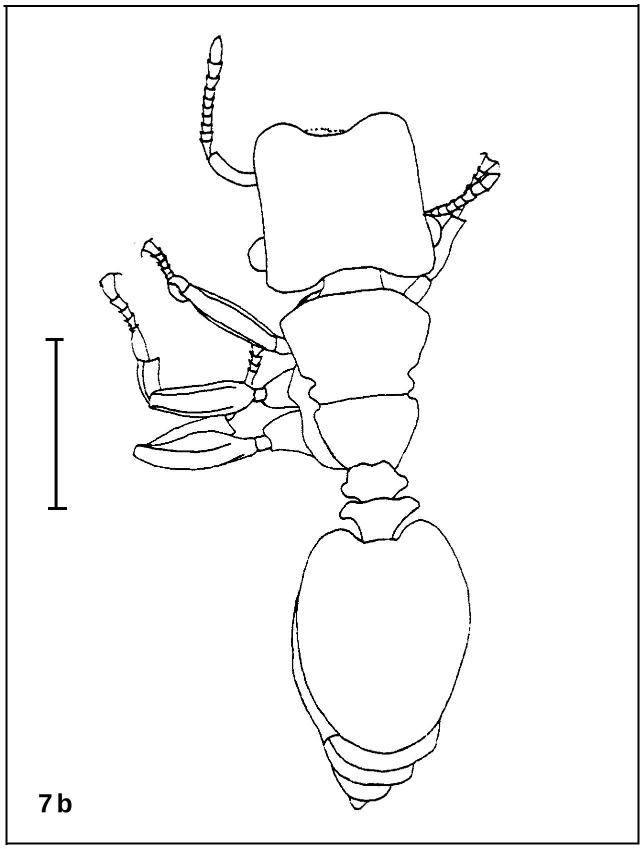
Head. Length ~ 1.5 mm; width 1.4 mm. Dorsal sculpture alveolate. Each alveolus contains a relatively long appressed canaliculate linear hair. Borders of disc entire. Denticules on vertex absent.

Thorax. Total length 1.1 mm. Dorsal striation absent. Pronotum and mesonotum dorsally divided by a very short suture on both sides; less than one fourth of an imaginable complete suture present. Length of promesonotum 0.7 mm; width 1.3 mm. Lamina on lateral borders of promesonotum truncate.

Peduncular segments. Petiole and postpetiole with a very small lamina. Petiole with a blunt tooth on each



7a



7b

side. Postpetiole broader than petiole and with a blunt spine on each side. Width postpetiole 0.6 mm.

Gaster. Width approximately 1.3 mm. Antero-lateral borders with small laminae.

Remarks. The only worker of *Z. obscurus* available is deposited in the MCZ. The length of the head and thorax could not be measured due to the inconvenient position of the ant in the amber; both the head and gaster are strongly bent downwards. A drawing of the dorsum of the body could not be performed for the same reason. The position of the head of the holotype worker in the amber hampers a complete observation and is responsible for the name given. The species is very close to the next one described. For the discriminating characters see below.

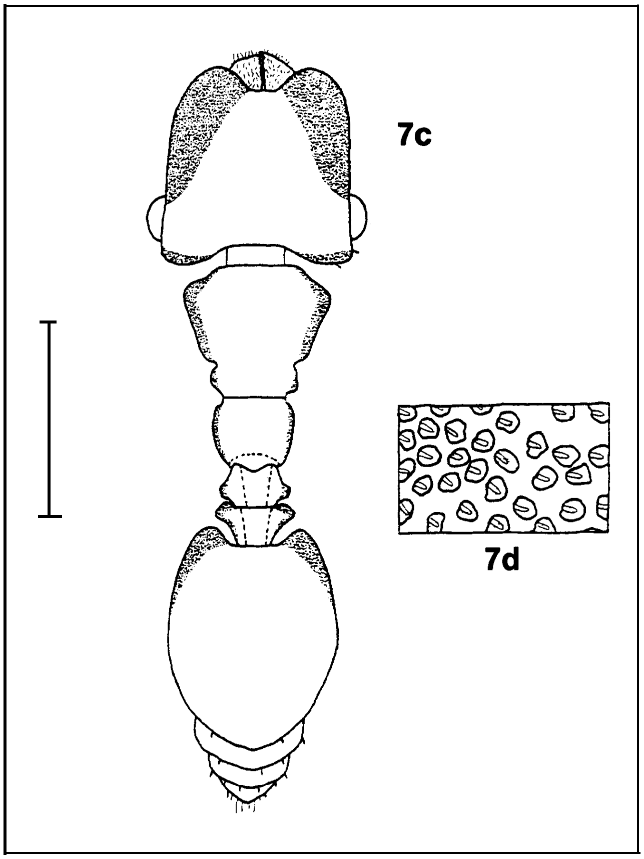


Figure 7. Worker of *Zacryptocerus pseudo-aztecus* n.sp.
7a. In Dominican amber
7b. Habitus (bar: 1 cm)
7c. Dorsum, without appendages (bar: 1 cm)
7d. Dorsal sculpture vertex (magnification approx. 120 x)

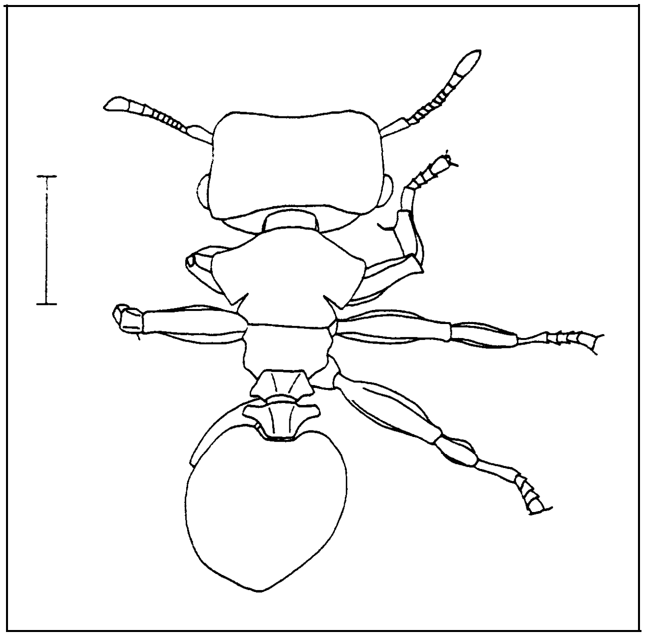
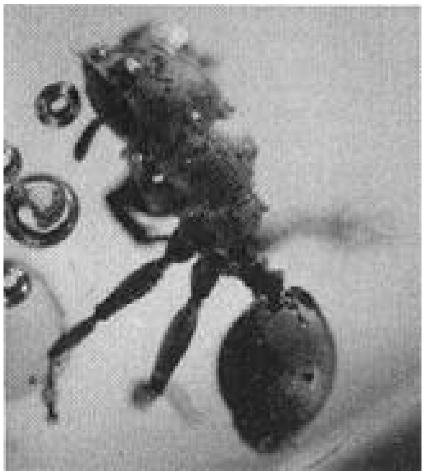
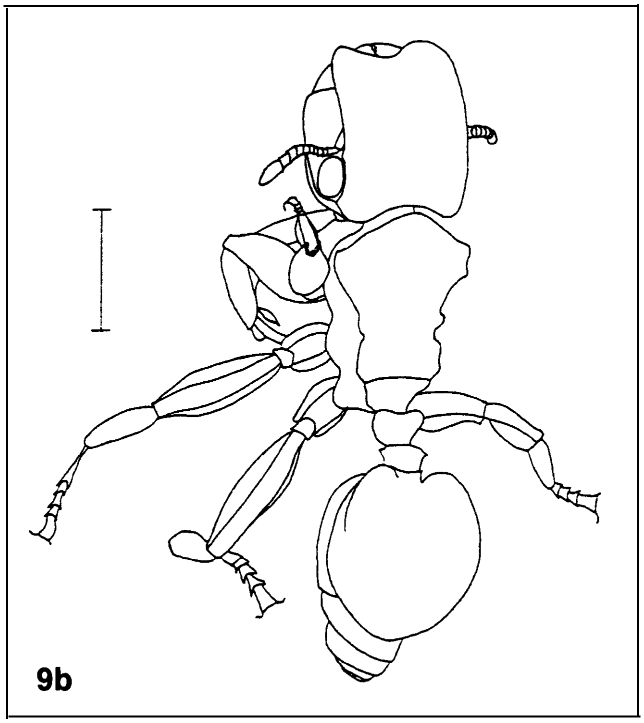


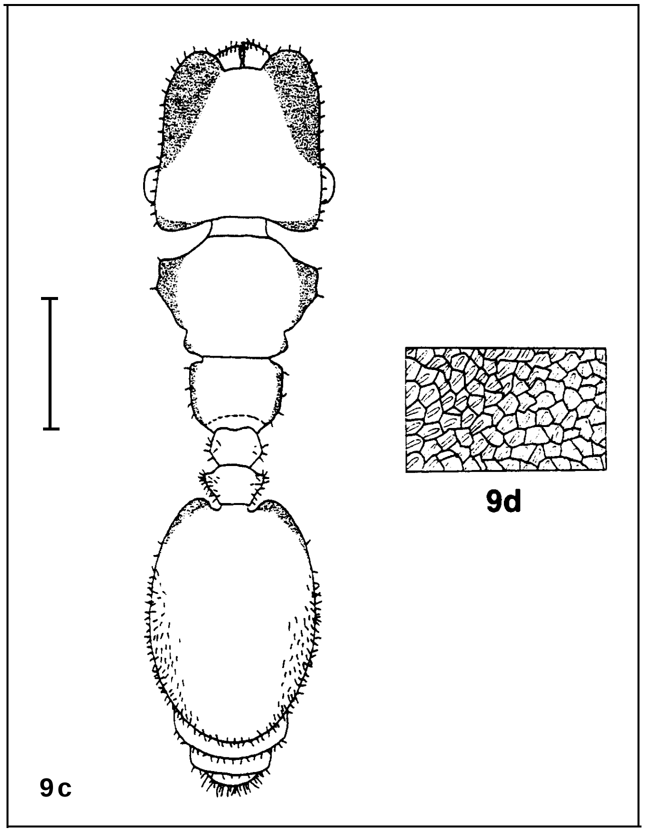
Figure 8. Habitus of worker of *Zacryptocerus obscurus* n.sp. (bar: 1 cm)



9a



9b



9d

9c

Figure 9. Worker of *Zacryptocerus alveolatus* n.sp.
9a. In Dominican amber
9b. Habitus (bar: 1 cm)
9c. Dorsum, without appendages (bar: 1 cm)
9d. Dorsal sculpture vertex (magnification approx. 120 x)

Zacryptocerus alveolutus n.sp. (Figures 9a-9d)

Diagnosis worker. Total length 5.5 mm. Most body hairs appressed and club-shaped. A small number of these hairs stand laterally on dorsal surface of the peduncular segments and posteriorly on tergite I of gaster. On the lateral borders of all body segments many club-shaped hairs point outwards horizontally. Together these hairs give the body surface a ciliate appearance.

Head. Length 1.6 mm; width 1.4 mm. Dorsal sculpture alveolate. The alveola contain relatively long appressed canaliculate club-shaped hairs. Sides straight; disc posteriorly entire. Denticules on vertex absent.

Thorax. Total length 1.4 mm. Dorsal striation absent. Pronotum and mesonotum completely fused. Length of promesonotum 1.0 mm; width 1.4 mm. Lamina on antero-lateral borders of promesonotum truncate.

Peduncular segments. Unarmed petiole without lamina. Postpetiole laterally unarmed and without lamina. Width postpetiole 0.5 mm.

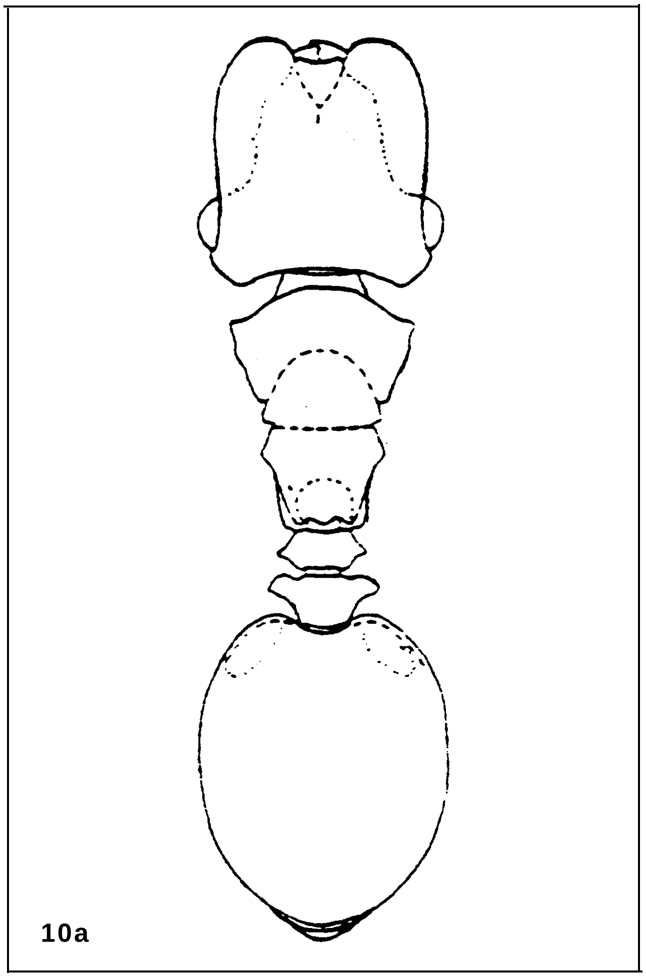
Gaster. Length 2.1 mm; width 1.3 mm. Antero-lateral border with small lamina.

Remarks. *Z. alveolatus* is named after its numerous alveola present on the dorsum of the head, thorax and peduncular segments. The only worker available is deposited in the collection of JS. The species is very close to *Z. obscurus*. It differs in the unarmed peduncular segments and the numerous outward pointing linear hairs on the lateral border of tergite I of the gaster.

The Other Cephalotine Ants from Amber

Four Cephalotine amber ants from Dominican amber could not be identified to the species level. These four ants were workers. Either the position of the ant in the amber or the presence of fungal hyphae hampered the observation of crucial parts of the ant. The presence of these hyphae on and in amber insects is not uncommon. The insect is not always embedded in the tree resin completely at once. So, if the time period between dying of the insect and the total inclosure is long, then fungi may profit from this period in the moist tropical circumstances of the amber-producing forest by attacking the dead ants.

The four ants belong undoubtly to the genus *Zacryptocerus*. Two of them are close to or identical with *Z.*



pseudo-aztecus and one with *Z. squamosus.* The remaining one could not be associated with any of the species described above. These four ants are deposited in the MCZ.

Comparison with Living Species

Representatives in Dominican amber of *Exocryptocerus* are not known from the living ant fauna. From the description of the genus *Exocryptocerus* (see above) it is clear that this genus is distinct from the four present-day genera of the tribe. Several amber species of the genus *Zacryptocerus* are close to some present day species of the same genus. For comparison a selection of *Zacryptocerus* species has been performed based on corresponding morphological features given by Kempf (1951; 1958). Five species have been studied for this purpose.

Zacryptocerus aztecus (Forel) (Figures l0a-10c)
Material: Mexico, Morelos: Cuernavaca, (date unknown); leg. WM. Wheeler, det. S.P Cover: one worker (MCZ).

Z. aztecus (Forel) is a species known from only one location in Mexico (Kempf, 1958). It is close to *Z. pseudo-aztecus* n.sp. Morphologically *Z. pseudo-aztecus* differs from *Z. aztecus* in the characters given in Table I.

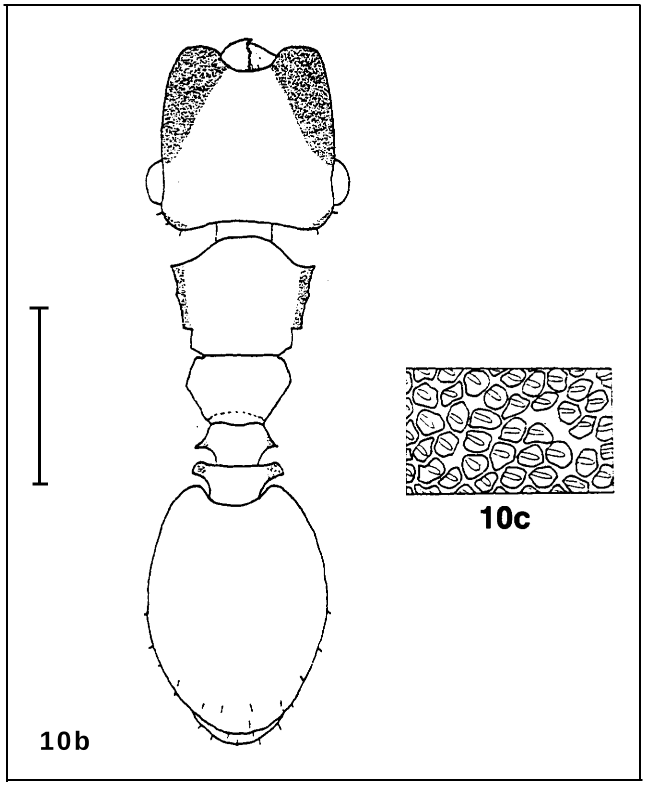


Figure 10. Worker of *Zacryptocerus aztecus* (Forel)
10a. Habitus, from Kempf, 1958
10b. Dorsum, without appendages (bar: 1 cm)
10c. Dorsal sculpture vertex (magnification approx. 120 x)

The following species of *Zacryptocerus* studied can be separated from the species of *Zacryptocerus* in amber by the presence of an inclination on the pro-mesonotum and a combination of characters given for each species below.

Zacryptocerus fiebrigi (Forel) (Figure 11)
Material: Argentina, Cordoba: Alta Gracia, La Granja, I-1925; leg. C. Bruch, det. W.W. Kempf: two workers (MACN).

Differential characters:
-Sides of headdisk weakly crenulate.
-At the border of the fused pro- and mesonotum a weak, but distinguishable inclination.
-Peduncular segments without carina; armed with strong spines.
-Thorax not lamellate, but at sides with a few teeth.
-Dorsal sculpture of thorax without striae

Zacryptocerus iheringi (Emery) (Figure 12)
Material: Brasilia, Rio Grande do Sul (date, locality and leg. unknown), det. C. Emery: seven workers (NMW).

Differential characters:
-Dorsum of head and thorax weakly reticulate and with relatively long linear hairs as in *Z. alveolatus* n.sp.
-Linear hairs rarely standing; normally lying within foveola.
-At the border of the fused pro- and mesonotum a weak, but distinguishable inclination.

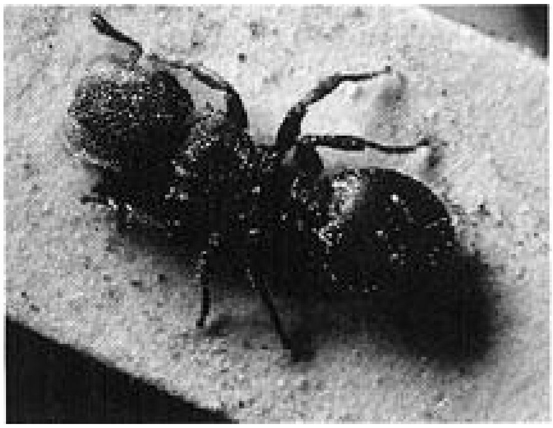


Figure 11. Worker of *Zacryptocerus fiebrigi* (Forel)

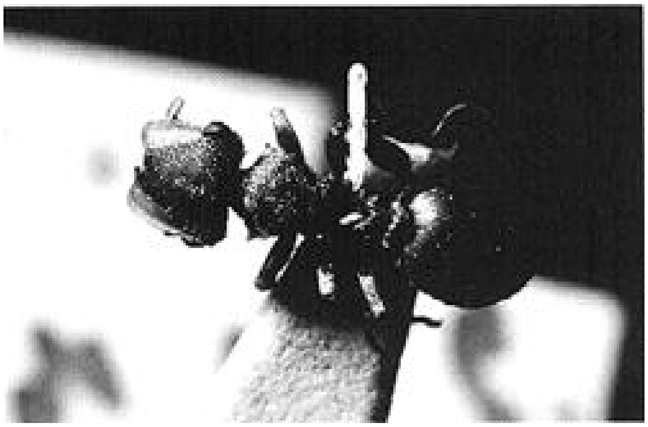


Figure 12. Worker of *Zacyptocerus iheringi* (Emery)

-Dorsal sculpture of thorax without striae.
-Sides of propodeum with strong teeth.
-Peduncular segments armed with teeth.

Zacryptocerus multispinosus biguttatus (Emery) (Figure 13)

Material: Costa Rica, Santa Clara Province, Hamburg Farm, 9-VIII-1923; leg. F. Nevermann, det. W.W. Kempf: three workers (NMNH).

Differential characters:

-Dorsal sculpture of head foveate, as in *Z. squamosus* n.sp.
-Vertex with a pair of denticules.
-Sides of head smooth.
-At the border of the fused pro- and mesonotum a weak, but distinguishable inclination.
-Promesonotum and propodeum dorsally finely reticulate. striae absent.
-Peduncular segments without carina.

Zacryptocerus haemorrhoidalis Latreille (Figure 14)

One of the species with monomorphic workers occurring in the Dominican Republic needs special attention here. *Z. haemorrhoidalis* was formerly the only representative of the genus *Hypocryptocerus* (Kempf, 1973). The known distribution area of the species is quite small: Hispaniola Island. Six forms of the species have been described, of which five forms have been studied:

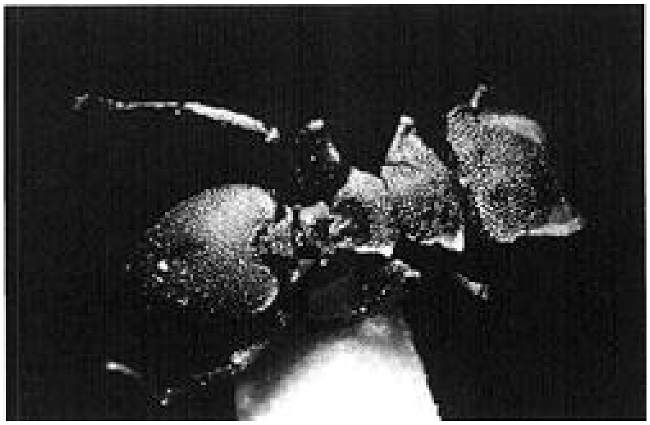


Figure 13. Worker of *Zacryptocerus multispinosus biguttatus* (Emery)

Table I. Discriminating morphological characters of Z. *pseudo-aztecus* n.sp. and *Z. aztecus* (Forel)

	Z. pseudo-aztecus	*Z. aztecus*
lamina head posteriolaterally	present	absent
dorsal sculpture head	foveate to reticulate	foveate
lateral lamina propodeum	present	absent
lamina petiole laterally	truncate	acute
lamina gaster anteriorly	present	absent

Z. haemorrhoidalis ssp. *affinis* (Wheeler): Haiti, Porte Terre Rouge, 5-X-1934; leg. J.P. Darlington: two workers (cotypes, MCZ);
Z. haemorrhoidalis ssp. *auricomus* (Wheeler): Dominican Republic. Sanchez. 22-27-V-1915 (two workers) and 28-31-V-1915 (one worker); leg. Watson (cotypes, MCZ);
Z. haemorrhoidalis ssp. *signatus* (Wheeler): Haiti, Mt. Basil, 9-IX-1934; leg. J.P. Darlington: one worker (cotype, MCZ);
Z. haemorrhoidalis ssp. *unimaculatus* (F. Smith): Dominican Republic: Samana. 2-6-VI-1915: leg. Watson: one worker; (cotype, MCZ);
Z. haemorrhoidalis ssp. *vinosus* (Wheeler): Haiti, Mt. Rochelois; leg. W. J. Eijerdam: six workers (cotypes, MCZ).

The six forms of *Hypocryptocerus haemorrhoidalis* can possibly be raised to species rank, but the availability of only one or a few worker specimens of most forms and the questionable identity of *H. haemorrhoidalis* (Wheeler, 1936; Kempf, 1951) make decisions precarious. The adult (male) has been described from only one form *(Hypocryptocerus haemorrhoidalis hamulus* (Roger), Wheeler and Mann, 1914). *H. haemorrhoidalis* has the monomorphic worker in common with the amber ants. Likewise the species also has the lack of an inclination on the promesonotum in common with most of the amber ants, but *H. haemorrhoidalis* can be easily distinguished from the amber specimen by the possession of two 0.5 - 0.7 mm long spines posteromarginally on the propodeum and numerous erect 0.13 - 0.20 mm long linear hairs on the dorsal surface of head and thorax.

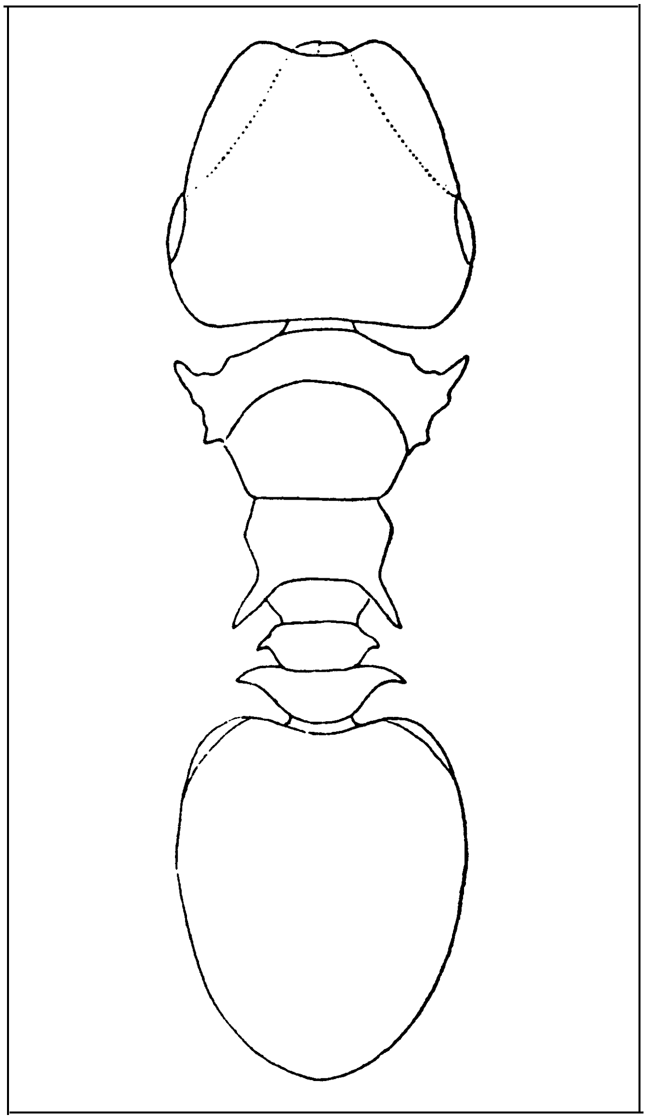


Figure 14. Worker of *Zacryptocerus haemorrhoidalis* Latreille; from Wheeler & Mann, 1914

The Living Cephalotini of the Caribbean

The living Cephalotini are distributed exclusively in the Neotropics and most of them have a continental distribution. Of the about 105 species described only 13 or 14 species belonging to three genera that live in the Caribbean. In the Caribbean the genus *Procryptocerus* is represented with four species just on Trinidad. This is also true for four species of the genus *Zacryptocerus.* Of the genus *Cephalotes* only one species occurs in the Caribbean *(C. atratus* Linnaeus); it is known only from Trinidad and St. Thomas (Virgin Islands). On St. Thomas, however, it is supposed to have been introduced by man (Kempf, 1951). This means that nine, more than half of the 13 or 14 Caribbean species, are only known from Trinidad. The fauna of Trinidad, however, is regarded as being strongly influenced from the South American mainland (Kempf, 1951). *Z. curvistriatus* is known from an interception in the USA with beans (in 1946), possibly originating from the Dominican Republic (Kempf, 1951). It is doubtful if this species is of Caribbean origin, because all other recorded interceptions of this species are from Costa Rica and Guatemala (Kempf, 1951; Vierbergen, 1992). So, the remainder, four species, are “true” inhabitants of the Caribbean. These species do belong to *Zacryptocerus* and are *Z. haemorrhoidalis* (Latreille), with seven exclusively Caribbean biotypes, Z. *emeryi* (Forel), Z. *pallens* (Klug) and Z. *varians* (F. Smith). Z. *haemorrhoidalis* is restricted to Hispaniola and from its biotypes only few specimens are available. New material and especially males and females of each biotype have to be collected for a well-considered decision on the problem of the variation. It is not unlikely that some of the biotypes can be raised to species level. *Z. emeryi* is only known from the type specimens, which were collected on Curacao (Kempf, 1951). *Z. pallens* has a wide distribution area, ranging from Argentina to Mexico. *Z. varians* is very close to *Z. pallens* and occurs in southern Florida, on the Bahamas, Cuba and Jamaica (Kempf, 1958).

Discussion and Conclusions

A study of 18 of 22 available Cephalotini in Dominican amber showed a classification into nine species. These species can be distinguished from the living Cephalotini in several morphological characters.* The high number of amber species indicates the Cephalotine fauna of the Caribbean was more numerous in the past than it is today (four species). An explanation could be the extinction of a specific habitat for the ants. So, it is known that the Dominican amber originates from the extinct tree *Hymenaea protera* Poinar. A strong linkage to a particular tree species of the Cephalotini found, is, however, unlikely, because the well known living species of the Cephalotini were collected from plants belonging to several different plant families (Wheeler, 1942). There is no indication whatsoever of any linkage of a Cephalotine ant to a specific tree.

The four extant species of Caribbean *Zacryptocerus* bear no close relationship to the nine species from the amber described in this study. Apparently a large number of species became extinct. This and the high number of other ant genera in Dominican amber reported by Wilson (1985) and Poinar (1992), the presence of most ant sub-families in this amber and the absence of genera like the Australasian *Leptomyrmex* in the modern fauna of the Caribbean (Baroni Urbani and Wilson, 1987) indicate that the ant fauna and possibly the entire insect fauna of the Caribbean is now poor in comparison to the past.

Also investigations of spiders in Dominican amber show decreasing species numbers. Recently the spiders in amber have been investigated thoroughly (Wunderlich, 1988). The number of extant spider species of Hispaniola (at most 500) is assessed to be as high as the number of spiders in Dominican amber (approximately 300-500). Of the spiders many extant species are exclusively ‘ground living.’ In considering this, the number of ‘tree living’ species must have been higher in the past than the number living in trees today. The faunistic diversity has very probably decreased significantly in time.

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*An identification key to the amber species based on the keys published by Dr. W. W. Kempf is available and can be provided on request from the authors.

All insects and spiders found in Dominican amber belong to families, whose representatives live in tropical climates today. This indicates that the present climate in the Caribbean does not significantly differ from the climate in the "amber period." The cause of the depauperation in species is probably the result of major geographical and / or climatical changes in the region. The Cephalotini do not require a very specific habitat, but the area of distribution is restricted to the tropics of the New World. It is not clear yet, if the Dominican amber originates from the time before or after the Flood. If the origin is from after the Flood, then it has to be considered that drastic geological and / or climatical changes took place during this period.*

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*Editor's Note: It is interesting that these amber ants that are supposed to have been fossilized millions of years ago are so similar to modern ant species that there is a tendency for evolutionists to stop their research on them because they cannot be used to formulate theories of macroevolution! Creationists are understandably interested in similarities like these which seem at once to conflict with macroevolutionary change and long-age speculations.

LETTERS TO THE EDITOR

Correlating Tree Rings

In W. H. John's letter on tree rings (Volume 30, pages 129-131), He presented two bar charts supposedly showing continuity of ring thickness in the BC period for Irish oak trees. He used data from Pilcher, Hillam, Baillie and Pearson (1977). However, the data in that article were not actual ring thicknesses but they had been "converted to indices by fitting a polynomial curve to the data and expressing the yearly values as a ratio to the polynomial curve at that point . . . LONG TERM TRENDS ARE REMOVED" (p. 722, my capitals). The only information on ring width was given in Appendix 2 (p. 726), where the mean ring width for each site chronology was given (in units of 0.05 mm—not stated in the article but in personal communication from M. Baillie). Nevertheless, I suspect that the data, if available, would show little change from the average of approximately one mm ring width that seems to prevail for Irish bog oaks in the BC period. I have yet to see published widths for AD oaks.

For some years I have advocated two rings per year in the BC period until c. 500 BC which is the change point from Sub-boreal to Sub-Atlantic climate. Unfortunately this theory suffers from a severe lack of evidence! Another area of attack lies in dendrochronologists' use of the t-test, the statistical method by which individual trees or site chronologies are compared. A key criticism by Yamaguchi (1986) has never to my knowledge been answered. Yamaguchi wrote: "Since tree-rings are typically serially correlated, cross-correlation coefficients [e.g., t-test numbers] between standardized tree-ring series may be spurious and inflated" (Yamaguchi, 1986, p. 47) and "Tree-ring studies whose conclusions rest on 'significant' cross-correlation coefficients are therefore suspect. One example is the extensive use of CROS [a computer program to date floating oak chronologies in western Europe . . . because chronologies from this region show strong autocorrelation" (Yamaguchi, 1986, p. 51).

Where does that leave the European oak chronology? The final link-up across the first millennium BC for the British oak chronology was published in 1984 (Pilcher, Baillie, Schmidt and Becker, 1984, Fig. 2)—it depends on t-test values of about four which would be reasonable proof if the t-test has been properly applied. In the light of Yamaguchi's comments, t-test values of four may be worthless. A few decades or even a few centuries reduction in the first millennium BC will not solve all our problems but it may be a step in the right direction.

Most dendrochronologies have never been published in any detail, so it is impossible for an outsider to check the method or the figures. I would suggest that for all important chronologies there should be publication of ring width indices for each local chronology and the statistics linking the local chronologies. This would not require a vast amount of journal space. Until this has been done a chronology cannot be regarded as 'published' let alone proven. As an example of what can become apparent when a chronology is fully published, consider Kuniholm, Tarter and Griggs (1993); a local Anatolian dendrochronology produced no less than three different matches to the master chronology, each with t-values of four to five (Kuniholm et al., 1993, p. 189) and each apparently correct to a high degree of certainty! Until such time as Yamaguchi's points have been answered, a 'rule of thumb' might be to consider t-values of seven or more as certain, six as likely and five as probable. Is there a dendrochronology that does not depend on t-values of less than seven for the first millennium BC? If so, let it be properly published, otherwise there is no proven dendrochronology.

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Would The Global Flood Have Created A Big Mud Bowl? A Further Reply to Mr. Yake*

> Yake comment: The ratio of the Flood waters to the uniformitarian Phanerozoic Eon sediments is estimated to be approximately two to one by volume. The volume of water being 1,350 X 10^6 and the volume of Phanerozoic "Flood sediments" being 654 X 10^6. This ratio would have resulted in a "mud bowl." Life (both continental and oceanic) could not have survived this environment. The local Flood theory better explains the survivability of "species."

One of the more popular creationist Flood models, based on physical evidence, starts with the Pangaean supercontinent as the pre-Flood landmass. I support the breakup of the Pangaean supercontinent during the Flood event, when it was covered in water generated from atmospheric and subterranean sources. The continent broke apart and spread (following the Plate Tectonic theory for spreading continents) during the Flood event (Gen 7:11) (see Nevins, 1978; Froede, 1994). However, other creationists (e.g., Tippetts, 1979; Howe, 1979; Northrup, 1987) have suggested that the Pangaean breakup followed the Flood event, hence the creationist model for Plate Tectonics remains under investigation.

Antediluvian continental sediments during this Flood event would be destroyed, reworked, or precipitated as the Flood waters served to destroy terrestrial life (especially mankind—Gen 6:7) on earth. Reworked sediments would serve to bury flora and fauna rapidly in depocenters, creating the scattered "paleontological stratigraphic record." The creationist Woodmorappe (1993) has compiled and interpreted much of the paleontological record in such a manner in his excellent papers.

The Bible states that the Flood waters covered the pre-Flood earth's highest points by as much as 22 feet (Gen 7:19-20). The Antediluvian earth is not believed to have had mountains as high as those of today (Whitcomb and Morris, 1961, p. 77), so the Flood waters did not need to be tens of thousands of feet deep in order to flood the earth. If the earth's surface were in fact mud then the Bible would be in error and the Ark would have rested on a rising mud slurry instead of rising waters.

The Bible states that Noah could see the tops of mountains (Gen 8:5) as the Flood waters receded. This supports the belief that tectonic activity such as continental uplift and oceanic subsidence was occurring to accommodate the draining Flood waters. Lithified sediment is required in order to yield the uplifted mountains of Gen 8:5. The earth's highest mountains (i.e., Himalayas) have marine fossils within their strata and this would require both stratification of the original sediments and their subsequent lithification which would not fit with the "mud" theory. Much creationist research remains to be performed to define and refine the young earth Creation/Flood model. However, we can be assured that the Bible provides an accurate account of physical events which are evident in the modern geological record.

Today the earths landmasses comprise approximately 25 percent of the earth's surface and the oceans make up approximately 75 percent. The mean elevation of those landmasses has been calculated at +2,756 feet and the mean ocean depth at -12,304 feet (Davis, 1977, p. 19). Clearly the oceans contain sufficient size both in magnitude and depth of water to inundate the earth's terrestrial surface if tectonic uplift of the oceanic crust is invoked. Much more water exists than is currently seen in our oceans and seas. Using the same mechanisms fostered by Uniformitarians to raise and lower sea-level (i.e., tectonics and glaciation), we advocates of a global Flood can also explain how water covered the earth.

Was There A Local Flood?

The fact that both Flood water depth and the "first" observation of mountains are recorded in Gen 7:20 and Gen 8:5, respectively, tends to refute the concept of a local flood. If the Flood were local then mountains would already exist and should have become visible immediately after the end of the 40 days and nights of rain. Noah should have been able to see "mountains" following the end of the rain, so why would it be reported as taking 7.5 months (compare Gen 7:11 and Gen 8:5) for Noah to see mountains if the Flood were local? If the Flood were local then water would be deep only within that limited area and the fact that it covers "something" by 22 feet would be meaningless because land would have been always exposed somewhere else at a higher elevation.

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*This is part of a continuing series of letters answering objections that have been raised against a global or total flood.

Why did God have Noah and his family build an Ark for 120 years (Gen 6:3)? If the Flood were local, they could have just migrated and climbed to the highest mountains to build a rain shelter for the animals and themselves. Many more evidences supporting a global Flood can be found in Whitcomb and Morris (1961, pp. 1-35).

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BOOK REVIEW

Creationism in Twentieth-Century America, edited by Ronald L. Numbers. 1995. Garland Publishing, Inc. New York. Ten volumes. 4,280 total pages. $812.

Reviewed by Don B. DeYoung*

This series reproduces particular creation-evolution documents from 1903-1961. The words of creation pioneers still speak to us today; George McCready Price, Harry Rimmer, Arthur Brown, James Bole, among many.

Editor Ron Numbers stresses in the introduction that early creationists usually embraced day age or gap theories. However, this era might be called one of prescientific creation. Creationists were intimidated by science and made efforts to compromise wherever possible; this is no longer necessary.

The high price of the series largely limits it to libraries with a concentration in Bible-science books. The volumes would also have more value if a comprehensive index had been prepared.

Volume 1 A 1906 article by evangelist Alexander Patterson predicted that "if this theory [evolution] is accepted, we much look for widespread lapse from all Christian faith and, as conduct follows belief in all intelligent creatures, we shall see also great moral declension" (p. xi-xii).

In 1922, William Jennings Bryan described the evolutionary origin of the eye:

> A piece of pigment, or, as some say, a freckle appeared upon the skin of an animal that had no eyes. This piece of pigment or freckle converged the rays of the sun upon that spot and when the little animal felt the heat on that spot it turned the spot to the sun to get more heat. The increased heat irritated the skin—so the evolutionists guess, and a nerve came there and out of the nerve came the eye!

"Can you beat it?" Bryan asked incredulously "And that it happened not once but twice?" (p. xii).

Also included in this volume are articles by biologist Eberhard Dennert, theologian Luther Tracy Townsend, and geologist George Fredrick Wright. Wright initially promoted a Christianized Darwinism. Over time he became more skeptical of science and entered conservative religious circles. Wright edited *Bibliotheca Sacra* and wrote an essay for *The Fundamentals,* the 1900s manifesto of fundamentalism.

Volume 2 Creation-evolution debates were very popular during the 1920s-1930s. This volume gives the texts of eight such encounters. It is surprising to find today's topics being debated 70 years ago: vestigial organs, the origin of life, and the evolution of the horse. Included creationists are William Jennings Bryan, George McCready Price, and Aimee Semple McPherson.

Early creationists also debated each other for publicity purposes. William Bell Riley and Harry Rimmer had good-natured exchanges about the creation days. Riley liked the day-age theory; Rimmer preferred the gap theory. After one debate, Riley complimented Rimmer because he had ". . . come into a fellow's own crowd and beat him on the wrong side of the question!" (p. xii).

Volume 3 Arthur Brown, a medical doctor, quit his practice to become a popular creation speaker during the 1920s-1940s. Six of his messages are reproduced, several dealing with apologetics:

> Without water there would be no life, and with this substance, the Creator did some amazing things. It is made up with two gases, hydrogen and oxygen. Hydrogen is the most inflammable gas known, and oxygen is necessary to all combustion. But when God combined these two, He made something which will extinguish all the fires of earth if it be in sufficient quantity (p. 66).

This note is also included from the 1920s: The President of Wheaton College in Illinois, eager to improve the academic standing and visibility of his fundamentalist institution, coveted the services of [creationist Arthur Brown] (p. xi).

Volume 4 Nine pamphlets are presented by William Bell Riley (1861-1947) written between the world wars. This energetic pastor led a Minneapolis congregation of 3,550 members, and also wrote a 40-volume exposition of the entire Bible! He especially spoke out against the social impact of Darwinism. According to Riley, evolution theory causes men to "... go back to the heathenism of the past . . . trample the Sabbath day . . . refuse honor to father and mother . . . and commit adultery without conscience. In the struggle for survival only the stronger have rights that are to be regarded" (p. 206).

Ronald Numbers sees Riley as responsible for tying the early fundamentalist movement to anti-evolutionism, and "This legacy remains with us today" (p. xx).

Volume 5 Here are four complete books written by Byron Christopher Nelson (1893-1972). These works are reproduced complete with figures and indexes. Nelson's *Deluge Story in Stone* (1931) has long been on many of our shelves. Living in Wisconsin, Nelson became an expert on glacial terrain. He believed that the ice age was at its height 20,000 years ago (p. 404). A very interesting section contains 127 questions and answers about evolution, *A Catechism on Evolution* (1937). The questions are still being asked today, 60 years later, about homology, vestigial organs, flood evidence, and mutations. Nelson's answers remain valid and refreshing.

Volume 6 Harry Rimmer (1890-1952) was a self-taught pastor and evangelist who saw the dangers of evolution. His motivation in defending creation was to protect students from the apostasy of liberal professors (p. xi).

This volume reproduces 16 pamphlets from Rimmer. They cover such topics as embryology, the fourth day of creation, and the deluge. Rimmer had a clear, persuasive writing and speaking style. A popular speaker, he drew crowds of thousands. He also used radio to speak to over one million people (p. ix). His books, including *The Harmony of Science and Scripture,* sold 300,000 copies.

In 1921, Harry Rimmer began the *Research Science Bureau* to bring science credibility to his apologetics efforts. Little actual research was done, but the Bureau clearly proclaimed that creation was not outdated or anti-science. The Bureau was a forerunner of groups like the Creation Research Society and the Institute for Creation Research.

Volume 7 Three books and a tract are reproduced from George McCready Price (1870-1963). Price had an Adventist background. Editor Numbers makes much of this in the Introduction; Numbers attempts unsuccessfully to show that the creation view first began as a "backwater" idea of Ellen G. White.

The work of Price on flood geology was later popularized in *The Genesis Flood.* Although not a field researcher, Price showed great familiarity with the geology of his day. In the tract *Theories of Satanic Origin,* he strongly suggests a Satanic origin for evolution, based on its harmful influence.

Volume 8 Three-fourths of this book presents the writings of Harold Clark (1891-1986). The remainder is given to Frank Lewis Marsh (1899-1992). Both men were scientifically trained and former students of George McCready Price. The Clark material is profusely illustrated with diagrams and photos. He wrote much about the ecological sorting of fossils during the Flood. Clark also promoted the idea of a post-flood ice age, which Price had rejected.

Biologist Frank Marsh first coined the term "baramins" to denote the original living units of creation (p. xvi). He used the Hebrew words *bara* (created and *min* (kind). Marsh enjoyed a long, congenial dialog with the well-known geneticist Theodosius Dobzhansky. In one of his texts, Dobzhansky later cited Marsh as a credible scientist who rejected evolution (p. xix).

Frank Marsh was one of ten founders of the Creation Research Society in 1963. He served on the CRS board until 1969, helping shape the society.

Volume 9 This book reprints issues of three early creation journals including *The Bulletin of Deluge Geology* (1941). The first issue has articles on Dinosaurs and the Deluge (G. M. Price), Deluge Ice Data from Ocean Depths (B. F. Allen), and A Chemist's View of Genesis (O. L. Brauer). Such articles comprise the first published field work supporting modern creation. Other early articles include the Age of the Mississippi River (B. F. Allen, 1942, p. 241), Embryonic Development (Duke of Argyll, 1943, p. 357), and Origin of the Races (V. J. Johns, 1944, p. 385). There are no articles on astronomy during this time. Some pages from the 1908 *Creationist* by G. M. Price did not copy well and are unreadable. The other included journals contain a wealth of original thinking.

Volume 10 The beginning and rapid divergence of origins thinking within the American Scientific Affiliation (ASA) is shown by 47 articles, letters, and discussions from the *ASA Journal* (now called *Perspectives).*

Within three years of its founding, ASA spokesman J. Lawrence Kulp saw his mission as "the necessary destruction of flood geology" (p. xxiv). Within 20 years, theistic evolution was an accepted position of members.

Articles by Walter Lammerts and William Tinkle give a refreshing contrast to much of the included ASA material. In 1950, William Tinkle wrote a delightful study of the Genesis word "good." At the conclusion, the ASA editor humorously adds, "I still can't see the good of a rattlesnake!" (p. 300).

As in the other volumes, the topics of nearly 50 years ago have a modern sound: Pleochroic Halos (F. A. Everest, 1948, p. 170); Recession of the Moon (P. W. Stoner, 1948, p. 27); Specimen Ridge, Yellowstone National Park E. K. Gedney, 1948, p. 98).

Here the 10 volume series ends, with articles through 1961. Perhaps editor Numbers stopped too soon. An eleventh volume could have given the foundational documents concerning the *Genesis Flood* (Morris and Whitcomb, 1961), the Creation Research Society (1963), and the Institute for Creation Research (1972).

Quote

Psalm 92:4-5

For you make me glad by your deeds, O Lord; I sing for joy at the works of your hands. How great are your works, Lord, how profound your thoughts!

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'PITHECANTHROPUS IV": A HUMAN EVOLUTIONARY ANCESTOR OR AN ARTIFICIAL RECONSTRUCTION?

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Abstract

In 1939 the remains of an early "hominid" were discovered in Java. These remains have been interpreted as representing an intermediate form between Australopithecus and Homo erectus. However, statistical and morphological data show these remains to be an artificial combination of disparate (dissimilar) skeletal elements.

Introduction

In 1939 the cranial remains of an "early hominid" were discovered in the Sangiran district of central Java. Called *"Pithecanthropus* IV" (also Sangiran 4 or *"Pithecanthropus modjokertensis"),* the remains were first reported by von Koenigswald and Weidenreich (1939) and later exhaustively described by Franz Weidenreich (1945).

The specimen consists of the posterior two-thirds of the cranial vault and the lower portion of both maxillae and associated dentition, including ten teeth (Jacob, 1975; Day, 1986). Several paleoanthropologists have argued that this specimen may represent an earlier ancestral form to *Homo erectus,* or at least a taxon that gave rise to the evolutionary grade of *H. erectus* (von Koenigswald, 1973; 1975a; Jacob, 1975; 1979). However, other paleoanthropologists have called attention to the extreme anatomical peculiarities of this specimen (Krantz, 1975; Phillipps, 1991). The purpose of this study is to establish whether or not these remains may have been incorrectly reconstructed.

Anatomical Description

The cranial remains are represented by a nearly complete occipital bone, including the occipital condyles and foramen magnum, temporal bones, and the posterior part of both parietal bones. The specimen has a massive occipital torus that projects backward beyond the level of the supraoccipital squama. Marked impressions on the nuchal area of the occipital bone indicate powerful neck muscularity. The remains display a marked frontal keel with parasagittal depressions (Day, 1986, p. 348).

In addition, the maxillae are represented by complete alveolar processes, except for the posterior part of the left side. Almost the entire palate is intact, and the floor of the nasal cavity, as well as the maxillary sinuses of both sides, are also preserved. However, the maxillae were crushed, probably before fossilization, causing distortion of this area of the face.

All of the dentition is intact, except for the incisors and the left second and third molars. The palate displays some peculiar "primitive" characteristics. For example, the canines are unusually large by comparison with most "hominids" within *H. erectus* (which most evolutionists believe *"Pithecanthropus* IV" has direct affinities to) and their breadths exceed their lengths (Weidenreich, 1945; Day, 1986). Of particular importance is the fact that the specimen's canines project below the level of the adjacent teeth and there is a diastema (gap) between them and the lateral incisors (Wolpoff, 1980). These are pongid traits not normally found in the combination described above (see Figure 1).

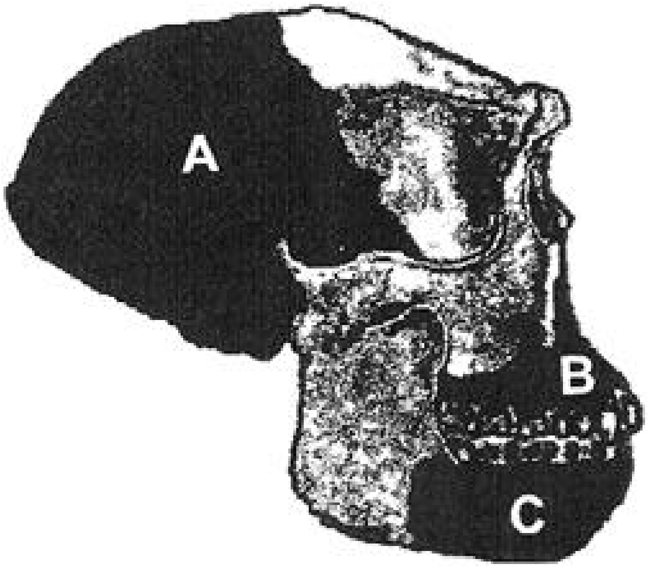

Figure 1. Lateral view of *"Pithecanthropus* IV' Part A appears to be of the genus Homo. Part B appears to be from the genus *Pongo* (Orangutan). Part C comes from a third individual referred to as *"Pithecanthropus* Mandible B."

Suggested Affinities

The *"Pithecanthropus* IV" specimen is highly problematic to any evolutionary scenario. It shows a number of *H. erectus* features, including thickened bones of the cranial vault, backward projecting attachment area for the neck muscles, and a spongy bone development at the cranial base. However, the palate and its dentition are unlike *H. erectus,* instead resembling the genus *Pongo* (Krantz, 1975, p. 361). It is highly suspect how a specimen considered to be either a Javan geographical variety of *H. erectus,* or a taxon that was a precursor, could somehow have characteristics allegedly lost long ago by its evolutionary ancestors.

As a result of this unusual mixture of cranial characteristics a number of evolutionary interpretations have been given, none of which fits the available data. Hulse (1971, p. 214) complains that:

> The cranial capacity [in *"Pithecanthropus* IV"] is much greater than among apes and approaches that of *Homo sapiens.* But the canine teeth are more ape-like, and no one has advanced a satisfactory hypothesis to explain this fact.

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Despite such difficulties several possible explanations have been suggested. The first of these is that *"Pithecanthropus* IV" shows a reappearance of characteristics from a distant ancestor of great antiquity (Krantz, 1975). However, such an explanation is not based on any empirical data but is rather a reflection of the plasticity in the Neo-Darwinian theory of evolution (Macbeth, 1971; Johnson, 1991).

A second possibility is that *Homo* may not be a descendant of the australopithecines at all (Zuckerman, 1970; Oxnard, 1975, 1984). The inference from an evolutionary interpretation is that:

> ". . . Australopithecines developed hominid dentition at an early date without significant increase in brain size, while the reverse was happening in the line leading to *Homo"* (Krantz 1975, p. 362).

While most creationists would agree that the australopithecines are not related to the origin of *Homo sapiens* (Gish, 1985), evolutionists are caught on the horns of a dilemma: There are either no evolutionary ancestors from the Villafranchian (the earliest part of the Pleistocene) if the australopithecines are rejected, or ancient pongids in some cases had more human-like dentition than "early *Homo."*

An additional possibility is here maintained: "that the brain case and palate [of *"Pithecanthropus* IV"] are from two different individuals" (Krantz 1975, p. 363).

A Questionable Reconstruction

In 1939, when G. H. R. von Koenigswald discovered the *"Pithecanthropus* IV" remains, it was assumed that all the fossil material involved belonged to one individual. At the time that was a reasonable assumption, since the remains were found in close proximity (although exact distances between the skeletal parts when they were excavated is unclear) in the same stratigraphic deposit, and the individual cranial parts showed the same general state of preservation. However, the individual skull parts do not contact or articulate in any manner. Instead, large areas of the front part of the skull are merely filled in, based on pure conjecture. In some cases reasonable reconstruction can be accomplished where one side or the other part of a skull or limb is missing, since many skeletal parts are anatomically mirror images of each other. However, in this instance far too much skull material is missing to accurately extrapolate what is in between.

The reconstructed skull of *"Pithecanthropus* IV" has been illustrated in numerous catalogs and atlases of fossil man, for example Brace, Nelson, and Korn (1971, p. 51) or Larsen and Matter (1985, p. 117). In every case known to the author, the reconstructed cast is not only shown to introductory students with the missing parts filled in but an additional set of remains, the *'Pithecanthropus* mandible B," has been used to reconstruct the mandible of *"Pithecanthropus* IV." If one were to look at the cast without checking one of the fossil man catalogs it would be impossible to tell that the reconstruction is based on at least two and probably three different individuals, at least one of which is likely pongid (see Figure 1). Although most casts establish which parts are based on recovered fossil bone (usually determined by color differences) versus the parts that were not recovered, one would not know from a cast alone whether or not all the remains were from one individual.

Evidence for More than One Individual

Krantz (1975, p. 363) has maintained that the palate cannot have come from the same individual as the *"Pithecanthropus* IV" skull because the reconstructed breadth is implausibly excessive. The external breadth as found is about 84 mm The left side was partially crushed in, therefore the reconstructed palate breadth is 94 mm (Weidenreich 1945, p. 32).

In all "hominid" and anthropoid skulls the glenoid fossae are extensively farther apart than are the external alveolar borders. However, the *"Pithecanthropus* IV" specimen has a reconstructed palate that shows the exact opposite.

To obtain statistical meaning for this, Krantz (1975, p. 364) measured external palatine breadths and the distances between centers of glenoid fossae in a sample of 17 *Homo sapiens* skulls. The results were:

> Palatine breadths were expressed as a percentage of the interfossa [glenoid fossa] breadths. These ranged from 58.9 percent to 74.2 percent, with a mean of 65.7 percent, and with a standard deviation of 4.16. For Java skull IV *["Pithecanthropus* IV"] it is 103.3 percent, which is over nine standard deviations away from the *H. sapiens* mean.

In addition Krantz (1975) took the same measurements on casts of five other ancient "hominids" and a selection of several different extant pongids, including chimpanzee, gorilla and orangutan specimens. The results were the same. Palatine breadth measurements were found to be within the range found in the *H. sapiens* sample.

However, von Koenigswald (1975b, p. 378) has maintained that the width between the third molars of *"Pithecanthropus* IV" is 68 mm not the 84 to 86 mm reported by Krantz (1975). In response Krantz (1975, pp. 377-378) has pointed out that his measurements of the breadth of the *"Pithecanthropus* IV" palate are the same as those determined by Weidenreich (1945). Further, Krantz (1975, pp. 377-378) has maintained that the differences between his measurement of palate breadth and that of von Koenigswald's stem from the fact that the fossil palate is broken through the socket of the first left incisor. The left maxillary area is shifted toward the midline and fossilized in that position. Both Weidenreich (1945) and Krantz (1975) moved the left maxilla back to its natural position and then measured what was the original palate. Krantz (1975) has maintained that von Koenigswald's measurements were apparently taken from the specimen in its distorted condition—a condition that is here argued to be of only minimal significance.

The Significance of *"Pithecanthropus* IV"

Although the *"Pithecanthropus* IV" specimen is not as well known to the public as are some "hominids," it has been considered an important intermediate form in documenting the alleged evolution from "earlier" Asian taxa to the main morphotype of *Homo erectus.* Le Gros Clark (1978, p. 120), after listing what he has maintained are diagnostic characteristics of *Homo erectus* states,

> A definition of the kind given above hides a further problem. It gives the impression that populations of *Homo erectus* are all more or less centered on an average "type" which we have defined. This, however, is obviously not the case. Not only are there considerable differences between the various and far-flung geographic races, but the long period of time, perhaps 1,000,000 years, through which *Homo erectus* evolved witnessed considerable changes in its morphology. Deep in the Djetis levels of Java lay that very primitive, heavily built skull (S4) ["*Pithecanthropus* IV"] with its 750 cc cranial capacity, while up in the Mindel deposits of Eastern Europe, dated not much more than 400,000 BP that extraordinarily modern looking Verteszollos occipital bone was discovered with its modern-sized brain. This may make trouble for the taxonomist, but it is precisely the kind of situation that paleoanthropologists are looking for: the fossil evidence of an evolving, changing lineage; one that moves from a more primitive to a more advanced state over a known period of time. The data may not respond to neat classification and categorization, but in this instance they demonstrate quite conclusively the general course and nature of hominid evolution.

In addition, the "*Pithecanthropus* IV" specimen has been dated as one of the oldest of the *H. erectus* specimens at 1.9 ± 0.5 million years B.P. (Jacob, 1981; Cybulski, 1981). Further, the "*Pithecanthropus* IV" remains and two other specimens associated with the "*Pithecanthropus modjokertensis*" taxon (the skullcap of an infant from Perning [Mojokerto], and the fragmentary mandibular remains of an adult, Sangiran 1b) have been proposed to have been at the very base of the origin of *Homo erectus* as part of a morphotype that may have extended back as far as 2.4 to 2.5 million years B.P. (Cybulski 1981). However, claims of great antiquity for the Asian *H. erectus* specimens listed above were based solely on the widely quoted K-Ar date of 1.9 ± 0.5 million years B.P. for the Puchangan beds at Mojokerto discerned by Jacob and Curtis (1971, p. 50). By the middle of the 1980's several evolutionists became highly critical of such an old age for *H. erectus* remains in Asia, since most evolutionary scenarios for the origin of *H. erectus* suggest an African origin. For example Bilsborough and Wood (1986, p. 305) pointed out that the K-Ar date has a large associated error, and that one isolated estimate is of little value. Others noted the confusion over the proximity of the dated sample to the Mojokerto calvaria (also called Perning 1) (Swisher et al., 1994). Therefore some workers revised the age of "*Pithecanthropus* IV" down to about 1.3 million years B.P. (see Table I) (Pope and Cronin, 1984; Pope, 1988; Rightmire, 1990). However, most recently Swisher et al. (1994) have obtained radiometric dates that strengthen the earlier 1.9 million years B.P. age for the "*Pithecanthropus* IV" / Mojokerto morphotype. The Swisher et al. (1994) study obtained data from ^{40}Ar/^{39}Ar laser-incremental heating of hornblende separated from pumice recovered at the Mojokerto "hominid" site in Java. The samples yielded "well-defined plateaus" with a weighted mean age of 1.81 ± 0.04 million years B.P. Since the oldest dated African *H. erectus* specimens known at the present time, those from Koobi Fora in Kenya, are interpreted to be about 1.8 million years old, the oldest H. erectus remains in Asia are of comparable age. Therefore, evolutionists can no longer dogmatically maintain an African origin for *H. erectus*. The "early" date of "*Pithecanthropus* IV," coupled with its unusual morphology, make it an important specimen in evolutionary scenarios of "hominid" evolution.

Table I. The oldest known pertinent *H. erectus* sites and their comparison in age B.P. to the "*Pithecanthropus* IV" and Mojokerto specimens. The assigned ages are based on an evolutionary interpretation of radiometric and biostratigraphic data. The ages for each specimen are rounded to the nearest 100,000 years before present. After Cybulski, (1981); Gibbons, (1994); Swisher et al., 1994.

Years B.P.	Africa	Asia	Europe
500,000		Zhoukoudian	
600,000			Maur
700,000		Lantian?	
800,000	Ternifine?		
900,000		Trinil?	
1,000,000			
1,100,000			
1,200,000			
1,300,000		°*Pithecanthropus* IV younger date	
1,400,000	Olduvai Gorge		
1,500,000	Konso Gardula Swartkrans? Nariolotime	Dmanisi?	
1,600,000		Sangiran	
1,700,000			
1,800,000	Koobi Fora	Mojokerto	
1,900,000		°*Pithecanthropus* IV older date	
2,000,000			

In sum, although the dates assigned to Pleistocene "hominids" such as "*Pithecanthropus* IV" are highly questionable (Lubenow, 1993), if the specimen actually consists of the remains of one ancient individual that would strongly support an evolutionary change from an earlier taxon into the general *H. erectus* morphotype (unless the specimen represents a curious mosaic, like *Archaeopteryx)*. The reason is that this specimen contains a suite of unique characteristics (described above) not found in other individual *H. erectus* specimens.

On the other hand, if the "*Pithecanthropus* IV" specimen is not valid then the characteristics which make up the *H. erectus* morphology may be more easily interpreted within a creationist framework. For example, several evolutionists, including Jelenek (1978; 1980), Wolpoff, Wu, and Thorne (1984), and Stringer (1993), as well as creationists (Lubenow, 1992) have suggested the "sinking" of some specimens, or the entire taxon *H. erectus* into *H. sapiens*. The general morphology of *Homo erectus* is so much like *Homo sapiens* as to be indistinguishable in many characteristics.

For example the use of high resolution computer tomography, known as CT or Cat which yields three-dimensional images of small structures, has been used to scan the inner ear chambers of hominid fossils (including three *H. erectus* and four Australopithecine specimens), extant primates, and *Homo sapiens* specimens (Spoor, Wood, and Zonneveld, 1994).

Measurements were taken of the height and width of the arc of each semicircular canal from the inner ear area (from the sample noted above) during CT scans. Based on these measurements, the radius of curvature was calculated. The extant specimens in the sample were then used to correlate arc size of the semicircular ear canals with body mass. Spoor et al. (1994) argued that *H. sapiens* has a larger anterior and posterior canal and a smaller lateral canal than great apes when body mass is taken into account. Based on these data, Spoor et al. maintained that *H. erectus* had the same inner ear morphology as H. sapiens and was therefore an "obligatory biped."

Even more interesting were the results interpreted for the Australopithecine specimens. The Australopithecine inner ear dimensions resembled those of modern great apes such as chimpanzees and gorillas. That suggests a much more arboreal lifestyle for the Australopithecines than most evolutionists would like to admit. The reason for this is that bipedal locomotive behavior puts particular demands on the vestibular apparatus of the inner ear, since upright body posture requires balancing on a very small area of support.

H. erectus is so much like modern *Homo sapiens* that Richard Leakey (1992, p. 55) has stated,

> When I hold a *Homo erectus* cranium in my hand and look at it full face, I get a strong feeling of being in the presence of something distinctly human. It is the first point in human history at which a real humanness impresses itself so forcefully.

Conclusion

The reconstructed cast of *"Pithecanthropus* IV" is unquestionably the remains of at least two individuals and probably a compilation of three, at least one of which is a pongid. The implications of that evidence are significant. Few "hominid" remains have ever been proposed as transitional forms between the Australopithecines and *Homo erectus.* If macroevolution is true, such intermediates must have existed. However *"Pithecanthropus* IV" can no longer be put at the bottom of an evolutionary branch in a phylogenetic tree. Instead, it is at best a faulty reconstruction.

Still, many paleoanthropologists have maintained that *Homo habilis* is an intermediate taxon between *Australopithecus* and *H. erectus.* In fact *"Pithecanthropus* IV" has been considered by some evolutionists to be the Asian equivalent of the African *Homo habilis* (Tobias and von Koenigswald, 1964; Le Gros Clark, 1978; Cronin, et al. 1981, p. 113). For example Cronin et al. (1981, p. 113) note,

> The African sample has generally been referred to as *Homo habilis* L. Leakey, Tobias and Napier 1964, or simply *Homo* sp., while the earliest Javan hominids have been referred to as *Homo modjokertensis* von Koenigswald 1936 [including *"Pithecanthropus* IV"]. These two may be morphologically and temporally coterminous.

However, the postcranial anatomy of *H. habilis,* as recently established by the OH (Olduvai Hominid) 62 remains, have been described as "strikingly similar to that of some early *Australopithecus* individuals" (Johanson et al. 1987, p. 205). In addition the OH 62 humerofemoral index which is a measurement of the humerus length as a percentage of the femur length) is an estimated 95% (Johanson et al., 1987; Leakey and Lewin, 1992). Such a ratio is highly significant when compared to modern humans (about 70%), *Australopithecus afarensis* ("Lucy"; 85%), and modern chimpanzees (100%). This figure places OH 62 closer to chimpanzees than to *A. afarensis* ("Lucy") in limb ratios, causing Alan Walker to state,

> If they have an evolutionary scheme that goes from *afarensis* to *habilis* to *erectus,* then the limb proportions go from less apelike at something under three million years in *afarensis* to more apelike at 1.8 million years in OH 62, and then back to less apelike at 1.6 million in *erectus"* (Leakey and Lewin, 1992, p. 118).

Other workers have argued against the bipedality of *H. habilis* based on OH 8 (Oxnard and Lisowski, 1980). Still others have rejected *H. habilis* as a taxon altogether (Brace et al., 1973).

Therefore, although some fossil specimens have been proposed as intermediate forms between the Australopithecines and *H. erectus* (particularly specimens like *'Pithecanthropus* IV" and the *H. habilis* taxon), thus establishing human evolution as a fact, the evidence does not support such conclusions. Rather, it is here maintained that *"Pithecanthropus* IV" is at best a faulty reconstruction, and that those specimens called *"H. habilis"* may be an artificial amalgam of unrelated individuals compiled from other taxa.

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PANORAMA NOTE

Reprinted CRSQ Volume 22

Introduction

The *Creation Research Society Quarterly* has been published since 1964 (31 complete volumes). In an effort to make these volumes available, all of the missing issues have been reprinted. Brief synopses have been written on volumes 1-21 and have appeared in the previous 21 Quarterlies. In each synopsis, major articles are reviewed to give a person interested in scientific creationism a general idea of the contents of that volume. Many of the articles are of continuing interest and value.

Astronomy

An annular solar eclipse occurred on May 30, 1984. Englin and Howe (1985, pp. 7-9) reported on the event and discussed it from a creationist perspective. Armstrong (1985a, b, p. 123) presented short notes on the Sun's energy source and on Olbers' paradox. The limitations of the scientific method and creationist interpretations were included. A review of an article by Isaac Asimov on the unlikely circumstance of finding life outside our solar system was written by Wolfrom (1986, pp. 180-181).

Anthropology, Archaeology, Population Studies

A difficulty in classical hominoid theory from the science of molecular anthropology was noted by Jerry Bergman (1985, pp. 142-143). The famous fossil, known as Lucy *(Australopithecus afarensis)*, was claimed to be that of an "apeman." Mehlert (1985, pp. 144-145) indicated evidence to the contrary and stated . . . that Lucy was no more than a variety of pigmy chimpanzee . . ." (p. 145).

In a two-part presentation, Vaninger (1985a, pp. 33-39; 1985b, pp. 64-67) examined the so-called conflict of the antiquity of ancient civilization and biblical chronology. The author abstracted his work as follows:

> Near the end of the 19th century, A. D. White made the claim that historical and scientific evidence regarding the antiquity of ancient civilizations proved that the Biblical chronology was impossibly short and of no historical value. During the course of the 20th century, historians have been steadily decreasing their estimate of when ancient civilization began. In recent years, several scholars have been working on a radical revision of ancient history which reduces the antiquity of ancient civilization even further. These recent revisions of ancient history may very well prove to eliminate entirely any supposed conflict between Biblical chronology and the antiquity of human civilization (p. 33).

Some of the topics covered in this interesting series are:

Biblical chronology
Egypt
Oedipus and Akhnaton
Ages in chaos
Babylonian / Hittite empire
Sea peoples / Persians
The Exodus problem
Overlapping dynasties
The conquest of Canaan

The Tower of Babel
The carbon-14 cover-up
Astronomical dating methods
Pre-Historic man

Armstrong (1985c, p. 47) discussed human population growth in Canada in the 1700's and 1800's and compared these figures with postulated rapid population increases after the Flood.

Biology

General

The origin theories of mitochondria were carefully elucidated by Smith and Brown (1985. pp. 78-83). They concluded that the experimental data do not favor any evolutionary origin theory of mitochondria. So little is known about organellar biochemistry that *no* theory of origins can be deduced from the available evidence. Norbert Smith (1985a, pp. 105-107) discussed the role of creationist research in modern biology. The author made a case for "true science" and noted some of the flawed "findings" of evolutionists. He particularly examined the kind concept and God's pronouncement ". . . that it was good" at the end of the creation week and applied these concepts to possible biological research. The healing properties of garlic and onion were briefly outlined from a creationist perspective by Smith (1985b p. 124). A penetrating commentary on allopatry was given by Armstrong (1985d, p. 124).

Zoology

Smith (1985c, pp. 16-20) continued his research on the results of crowding on the rate of asexual reproduction of the planarian *Dugesia dorotocephala.* The inadequacy of natural selection to explain the results was recorded. The organism ". . . regulates its own population density at healthy levels without need for starvation, disease or predation." (p. 16) which would be expected from a design viewpoint. Hamilton (1985, pp. 59-64) explained how the retina of the eye in vertebrates and invertebrates was an evolutionary road block. The captions of Figures 2 and 3 were reversed at the time of printing.

An excellent article on the origin of the Kaibab squirrel was written by John Meyer (1985, pp. 68-78). Not only was the tassel-eared squirrel population examined, but the author presented indirect evidence that indicated a recent origin for the Grand Canyon. Readers who study this paper should be aware that the photographs in Figure 5 and 6 were mistakenly reversed after the galley proof stage. Topics covered in the treatise were:

Abert squirrel description
Kaibab squirrel description
Taxonomic studies
Grand Canyon climatology
Age of Grand Canyon
Hardy-Weinberg Law

Williams (1986a, p. 182) briefly discussed an exhibit of Kaibab and Abert squirrels in the Smithsonian Institute Museum of Natural History and noted that it agreed with certain aspects of the conclusions of Meyer about the animals. A study of insects found on the Van Andel Research Center property was presented by Sanders and Howe (1986, pp. 166-170). Aspects of the origins debate concerning the creatures were detailed in the fascinating discussion.

Chemistry

The properties of water (solid, liquid, and gaseous states) were viewed from a design standpoint (DeYoung, 1985, pp. 107-114). The importance of the hydrogen bond was emphasized. The hydrologic cycle and the anthropic principle were included in the dissertation. A brief minisymposium on the supposed chemical organization of matter in time an space by natural processes was contained in this volume. The suggested natural ordering suppositions were refuted by Williams (1986b, p. 157); Helmick (1986, pp. 157-158); Damon (1986, p. 158).

Education

John Moore continued his series of educational articles on various features of the creation-evolution controversy. The origin of life studies and experiments were discussed (Moore, 1985, pp. 20-25). The evolutionary model was presented and debunked. Although the experimenters were trying to "duplicate" natural chemical evolution i.e., the Miller apparatus, *unnatural* conditions were required to sustain the postulated process. Living cells vs. coacervates, science textbook views and the life-death continuum were examined. A creationist view of the problem was given. Then in a later article, Moore (1986, pp. 183-188) outlined the evolutionary and creationist views on the origin of man. He discussed the misinterpretations of human fossils often advanced by evolutionists, migration-dispersal models, geographic distributions of fossil finds and population analyses. These excellent studies are written in such a manner to provide lecture material for teachers dealing with the particular subject matter.

Geology

Armstrong (1985e, p. 47) offered an unique interpretation of the angularity of sand grains when postulating whether a sediment was deposited by wind or water. The bibliography of presumed overthrusts was continued in this volume of the Quarterly (Lammerts, 1985, p. 127; 1986, pp. 188-189) to encourage field study of this phenomena by creationists. Cox (1986, pp. 158-166) discussed the origin of sandstone deposits. An expanding earth model during and after the Flood was developed by Unfred (1986, pp. 171-179). The following topics were considered in the investigation; contracting earth models, drifting continents, spreading oceans, plate tectonics, mountain building, ocean water accumulation, state of the antediluvian earth, ocean basins, asteroidal impacts, Quaternary rifting and Pelegian extinction. A progress report on the palynology of Hakatai shale, illustrating some of the pollen grains detected, was given by Howe et al. (1986, pp. 181-183).

Philosophy

The "validation" of Scripture by science was viewed skeptically by Bruce Smith (1985, pp. 96-97). Two world views based on chance was the subject of a letter by Grimm (1985, pp. 97-98). The importance of philosophy in the origins debate was compellingly presented by Ancil (l985, pp. 114-123). Since one's philosophy generally determines one's position on scientific matter, readers are encouraged to study this treatise. There has been a sporadic disagreement that often surfaces between creationists as to what is most important, the gathering of scientific data within a creationist concept or waging the war against evolutionism on a philosophical battleground. I contend that both are vital functions within the creationist movement. Howe (1986, pp. 141-142) suggested that the biblical creationism model should be kept separate from creation science. Creationism labeled as metaphysics was examined by Bergman (1986, pp. 203-204).

Physics and Mathematics

Chaffin (1985, pp. 10-16) continued his work on the Oklo natural uranium reactor as evidence for a young earth. Included in this article was a brief examination of variable decay constant models. "Variable constants" was the subject of a symposium in a later volume of the Quarterly. In a series on theoretical mathematics, Herrmann (1985a, pp. 84-89; 1985b, pp. 128-137; 1986, pp. 189-198) developed a system into which the physical world could be interpreted as being constructed by a supernatural entity. The concepts explored were quantum theories, causality and determinacy, time, theories of natural science, falsifiability, scientific speculation, uniformity of nature, developmental processes and randomness.

Statistics, Extrapolation

A statistical analysis of the post-Flood lifespans as given in Genesis 11 was performed by Seaver (1985, pp. 39-47). He concluded that ". . . there are statistical calibration models using the natural logarithm of lifespan that show no gaps in the Genesis 11 genealogy" (p. 39). An important essay on extrapolation was written by Heyes (1985, pp. 25-33). Evolutionary scientists generally extrapolate present scientific laws and processes back in time millions and billions of years based on a very limited human scientific activity and observation of less than a few thousand years! Extrapolation of any scientific data either into the future or into the past is hazardous as is known by any engineer and scientist who has to deal with objects and organisms in a *real world.* Heyes pointed out many cases of unwarranted, absurd extrapolation as practiced by evolutionary theorists.

This volume of the Quarterly contains much useful information for creationists. Besides the articles, letters and notes reviewed, there are many other topics discussed in other letters, notes and book reviews within volume 22.

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Emmett L. Williams*

BOOK REVIEW

Extinction, Bad Genes or Bad Luck by David M. Raup. 1991. W. W. Norton. New York. 210 pp., $19.95.

Reviewed by Jerry Bergman**

This important book endeavors to answer the question whether "the billions of species that died in the geological past died because they were less fit (bad genes) or merely because they were in the wrong place at the wrong time (bad luck)" (p. xi). Of course, the reverse of this question is does the "survival-of-the-fittest doctrine explain the facts?" Raup, a paleontologist at the University of Chicago whom Gould calls in the introduction "the best of the best" concludes that most significant extinction events in history were caused not by natural selection, but due to the latter reason, bad luck.

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Further, Raup concludes that textbooks usually teach the opposite, namely that "species go extinct when they are unable to cope with change," or, in other words, because of natural selection. In spite of extensive research in trying to find the specific factors which were critical for selection causing species extinction according to the Darwinian model, Raup concludes "for none of the thousands of well-documented extinctions in the geological past do we have a solid explanation of why" (p. 17). He notes that there have been no shortage of proposals in each case, but that in all, other more plausible alternative scenarios exist. Further, none has predictive power in the sense that it can show that a given species became extinct because it was evolutionarily inferior. Of course, problematic in understanding evolution is the conclusion that "only a minuscule fraction of past life has been fossilized" (p. 27). Although this is speculation, we do have "tens of millions of excellently preserved fossils" and from these we have identified about 250,000 different species, even though "the quality of the fossil sample varies enormously from organism to organism and from one physical environment to another (pp. 27-28).

He concludes that somewhere between five and fifty billion species have existed in the past on earth- and only about one in one thousand of these species are still alive today—what Raup calls a "purely lousy survival factor" a "99.9% failure." As Raup admits, these numbers are enormously speculative—as are also the number of how many species are alive today, often given as from ten to one hundred million or more. If we have little idea of how many species are alive today, it is obviously quite difficult to determine how many species lived in the past with much accuracy. The number of *confirmed* species that once lived and are now extinct, though, is quite small compared to those alive today. Raup admits "because of erosional and other gaps in the rock record, it is extremely difficult for us to amass a sufficient quantity of high-quality data to say anything more than that the extinctions occurred sometime near the end of the Cretaceous" (p. 77). The vast majority are known only by teeth, distorted bone fragments, foot prints and other fragmentary evidence. We do know that "many major groups of plants and animals that were once important parts of the global biota no longer exist and left no descendants" because of abundant documentation in the fossil record, such as trilobites (p. 7).

A genus (or any other group) Raup concludes "by good luck alone . . . may thrive for a considerable time" and if good luck produces a lot of species, the chances that the genus will become extinct is greatly lessened (p. 51). The example he gives is rodents, of which there are more species today—about 1,700—than any other order of living mammals. Next in diversity is the bat—almost 900 species—meaning fully about two-thirds of all living mammal species are either rodents or bats. Is this true because rodents and bats are so extraordinarily evolved or "could this be just luck" (p. 52). Raup concludes that luck is a major factor, if not the most important one: animals "do not struggle for existence, they gamble" (p. 51). Likewise, "extinction of a group is most common when the group starts out small, just as a casino gambler is most likely to go broke quickly if he starts with a small stake . . ." (p. 54).

It is often assumed that ancient organisms were simple and primitive but most modern organisms are far more complex. The simple to complex evolution scenario is most often cited in the case of human evolution, an area that Raup concludes "is difficult to study because the fossil record is incredibly bad" (p. 39). This complexity evolved because of the survival of the fittest law, i.e., those organisms that were better adapted were more apt to survive, and better adapted often meant more complex organisms. A study of ancient organisms finds that this generalization is hard to defend. The example Raup gives is that of the trilobite's eyes which have two lenses, one above the other, a design which in the field of optics is called a **doublet.** The specific shape of the trilobite's upper lens though, "is unlike any now in use either in nature or in man-made optics" (p. 35). Research on the trilobite lens by Levi-Setti found that its design minimizes spherical aberrations under water and is of a level of sophistication that "in human terms would require a highly trained and imaginative optical engineer to design the system (p. 35). Given evolution and this knowledge of trilobites, one would expect to see far more evolved lenses in modern crabs and shrimps. Comparative studies, though, find "there is no evidence that the eyes of the modern crab are better" (p. 35).

Not able to find a logical reason for most extinctions, Raup and his coworkers proposed that "catastrophic extinctions" occurred million years ago, a class of events which is now estimated to have occurred in the Ordovician, Devonian, Permian, Triassic, and Cretaceous, collectively called the "big five extinctions." Little hard evidence, though, exists for these rapid extinctions aside from being a useful explanation to deal with past extinctions. The best documented extinction is often referred to as the K-T, referring to the boundary between the Cretaceous (abbreviated K to avoid confusion with the Carboniferous and Cambrian) and the strata above it, the Tertiary. This extinction, though, faces an enormous amount of disagreement and is at present at best tenuous speculation.

Although Raup concludes that "poor predictions are better than nothing" this is often not true—they can mislead, and because "many paleontologists have strong views on the issue of" mass extinctions and related topics, poor theories are often given a validity that they do not possess (p. 79). Of course, a major concern in this scenario is that if a species that is critical to the ecological balance dies out because of random events, this could prove tenuous for all of life. Because this did not happen also argues against the natural selection view.

This excellent, well written, easy to follow book is a must for all creationists because it vividly shows that one of the major planks in the evolutionary theory, the survival of the fittest hypothesis, is seriously flawed: Darwinian factors most often or never cause extinction. Even evidence for extinction caused by disease is seriously lacking: "epidemic disease remains a 'normal' stress for the unproven potential of killing widespread species" (p. 184).

CONFERENCE REVIEW

The Evangelical Engagement With Science. Wheaton College, IL, March 30-April 1, 1995. Sponsored by the Institute for the Study of American Evangelicals (Billy Graham Center).

Reviewed by John Goertzen*

The *Engagement* was primarily a look at the history of evangelical attitudes toward science and was firmly dedicated to the premise that there is no conflict between the Christian religion, properly understood (or should I say properly *reinterpreted),* and modern science (with its domination by philosophical naturalism left unacknowledged). The speakers consisted mainly of historians; Davis Young noted that, at a conference devoted to evangelicals in science, there were few evangelical scientists on the program. Creationists should not ignore the history of science since those who interpret the past control the present, and those who control the present determine the future.

Ronald Numbers claimed that the word *creationist* originated in a 1929 letter from Harold W. Clark, a Berkeley trained biologist, who suggested it as a term to package his associate G. M. Price's flood geology. Numbers likes to marginalize creationism, which includes flood geology, by claiming it originated in a vision by avowed prophetess Ellen G. White (c. 1874). This spurious charge has been mimicked by Mark Noll. However, Byron Nelson's *The Deluge Story in Stone* cites a good number of early scientists, all before 1850, who believed in a cataclysmic worldwide flood that produced most fossils. Nelson also quotes a number of church fathers and Martin Luther as believing in a catastrophic global flood. (There is no denying that Adventist G. M. Price made a major contribution to flood geology in the early 20th century.) Numbers cited an estimate that in 1850 half of American Christians were young-earth, six-literal-day creationists and the great majority of these undoubtedly believed in a literal Genesis flood. The other half was split rather evenly between the gap and day-age theories. (This pre-dates Ellen White's prophecies but not Lyell's geologic ages.) Numbers seemed to enjoy reminding the home town crowd that in 1957 the Wheaton trustees were assured that the Wheaton faculty were *creationists.*

Rodney Stiling discussed *Scriptural Geology in America;* a mid 19th century effort spearheaded by three New Yorkers; brothers Eleazar and David Lord, and Martin Paine (not professional geologists). Geologist Hitchcock opposed these efforts with a Baconian compromise between geology and Scripture which involved an uncritical acceptance of Lyell's geology and considerable modification of Scripture. This contest pitted the belief that the Bible should be in authority over science against a dual revelation idea in which the Bible is always reinterpreted according to the demands of naturalistic science. It was stated that belief in a global cataclysmic flood is the defense of a hermeneutical preference. However, this idea has been refuted many times, perhaps most completely by Whitcomb and Morris. *Scriptural Geology* was remarkably similar to the later flood geology model and would make a fruitful area of study for creationist historians who might challenge Numbers' assertion that flood geology began with a vision by Ellen G. White. Stiling took great pains to emphasize that *Scriptural Geology* was not a reaction to evolution since it was propounded before Darwin's *Origin.* That analysis ignores the naturalistic geologic roots of naturalistic biology. Darwin applied the uniformitarian gradualism of Lyell's geology to biology in his *Origin.* So while *Scriptural Geology* was not a reaction to *biological* evolution, it was a biblically based counter to *geological* evolution.

According to David Livingston, theologian Charles Hodge saw Darwinian *natural selection* as antithetical to any role for the *supernatural.* Teleology had no context in Darwinism. Jim Moore compared evangelical credulity about the Lady Hope-Darwin conversion myth to belief in the historical veracity of the New Testament (this was challenged by several participants). Moore did not mention long-standing CRS efforts to inform the Christian community about this incorrect anecdote. Apparently he holds to a relativistic view of truth, stating; "truth is dependent on our relationships with each other." David Bebbington talked about how Paley glossed over the problem of suffering in his *watchmaker* argument. This seems to be due to Paley's inadequate view of the Fall and subsequent corruption of the original perfect creation. Rebecca McLeod's paper cited Francis Schaeffer's defense of Judeo-Christian environmental theology, but not all of its practice, against the attack of Lynn White. Schaeffer said, "If I love the Lover, I love what the Lover has made." Mark Noll mentioned Hutchinson's avowedly Bible-based alternative to Newtonian gravitation that persisted for about 100 years. The clear inference is that creationist beliefs are similarly anti-scientific and based on another erroneous interpretation of the Bible. D. G. Hart provided an interesting sketch of the evangelical relationship with scholarship. His conclusion: "Be wary of the [secular] academy and work to sustain the ghettos that have preserved us."

There were a number of claims that the warfare motif between religion and science is waning; though one participant observed that out of the ivory tower, in the real world, religion and science are seen as conflicting authority systems. Indeed, with wholesale accommodation of naturalism by neo-evangelicals on scientific matters there is no need for warfare by either party. However this does not end the contest, as the sharp dispute over the reliability of the New Testament shows. Perhaps a paper explaining the New Testament's references that affirm the literalness of Genesis 1-11 would have been an interesting project for this conference.

Today's young people are not buying the compromise that neo-evangelicals have made on origins. Christian apologist and evangelist Ravi Zacharias has said that today's young people do not think they can believe the Bible, mainly because they feel they cannot trust the first eleven chapters of Genesis. The phenomenon was recently illustrated when a 10-year-old girl at my sister's church youth group asked my sister (an adult leader) if she needed to believe in Noah's flood to be saved. My sister replied that, no, she did not have to believe in the Genesis flood to trust Christ, but hoped she would, since if the Bible is not trusted regarding that event one would tend to doubt the authority of its claims about Christ's substitutionary death. It may not be clear to evangelical intellectuals, but young people can tell whether we are offering a consistent picture of biblical truth.

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